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**WILSON  
ANNEX**

H. O. No. 129

**WEST INDIES PILOT  
VOL. II**



**1929**

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H. O. No. 129

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# WEST INDIES PILOT

Volume II

THE LESSER ANTILLES AND THE  
COAST OF VENEZUELA

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*FOURTH EDITION*

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1929

<sup>U.S.</sup>  
PUBLISHED AND SOLD BY THE HYDROGRAPHIC OFFICE  
UNDER THE AUTHORITY OF THE  
SECRETARY OF THE NAVY

PRICE 90 CENTS



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## NOTICE

### CONSULT THE LATEST SUPPLEMENT AND SUBSEQUENT NOTICES TO MARINERS

This book is corrected from information received in the Hydrographic Office up to the date noted in the preface. It should not be used for navigational purposes without consulting the latest supplement and subsequent Notices to Mariners.

H. O. No. 129

#### 1930 Supplement

A supplement containing information received in the Hydrographic Office from the date of publication of this book to January 1, 1930, will be issued in the early part of the year, and will be sent free of expense upon the receipt of this coupon at the United States Hydrographic Office, Washington, D. C.

Name \_\_\_\_\_

Address \_\_\_\_\_

H. O. No. 129

#### 1931 Supplement

A supplement containing information received in the Hydrographic Office from the date of publication of this book to January 1, 1931, will be issued in the early part of the year, and will be sent free of expense upon the receipt of this coupon at the United States Hydrographic Office, Washington, D. C.

Name \_\_\_\_\_

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# NOTICE

A copy of the report of the Hydrographic Office, showing the latest adjustment and subsequent notices to mariners, will be issued to the Hydrographic Office, Washington, D. C., as soon as the report is received. It should be noted that the Hydrographic Office is not responsible for the accuracy of the data used in the publication. It is the duty of the mariner to verify the data by observation and to report any errors to the Hydrographic Office.

U. S. N. 100

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H. O. No. 129

1932 Supplement

A supplement containing information received in the Hydrographic Office from the date of publication of this book to January 1, 1932, will be issued in the early part of the year, and will be sent free of expense upon the receipt of this coupon at the United States Hydrographic Office, Washington, D. C.

Name\_\_\_\_\_

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H. O. No. 129

1933 Supplement

A supplement containing information received in the Hydrographic Office from the date of publication of this book to January 1, 1933, will be issued in the early part of the year, and will be sent free of expense upon the receipt of this coupon at the United States Hydrographic Office, Washington, D. C.

Name\_\_\_\_\_

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H. O. No. 129

1934 Supplement

A supplement containing information received in the Hydrographic Office from the date of publication of this book to January 1, 1934, will be issued in the early part of the year, and will be sent free of expense upon the receipt of this coupon at the United States Hydrographic Office, Washington, D. C.

Name\_\_\_\_\_

Address\_\_\_\_\_



N. O. No. 123

1892 Supplement

A supplement containing information received in the Hydrographic Office from the date of publication of this book to January 1, 1892, will be issued in the early part of the year, and will be sent free of expense upon the receipt of this coupon at the United States Hydrographic Office, Washington, D. C.

Name

Address

N. O. No. 123

1892 Supplement

A supplement containing information received in the Hydrographic Office from the date of publication of this book to January 1, 1892, will be issued in the early part of the year, and will be sent free of expense upon the receipt of this coupon at the United States Hydrographic Office, Washington, D. C.

Name

Address

N. O. No. 123

1892 Supplement

A supplement containing information received in the Hydrographic Office from the date of publication of this book to January 1, 1892, will be issued in the early part of the year, and will be sent free of expense upon the receipt of this coupon at the United States Hydrographic Office, Washington, D. C.

Name

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H. O. No. 129

1935 Supplement

A supplement containing information received in the Hydrographic Office from the date of publication of this book to January 1, 1935, will be issued in the early part of the year, and will be sent free of expense upon the receipt of this coupon at the United States Hydrographic Office, Washington, D. C.

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H. O. No. 129

1936 Supplement

A supplement containing information received in the Hydrographic Office from the date of publication of this book to January 1, 1936, will be issued in the early part of the year, and will be sent free of expense upon the receipt of this coupon at the United States Hydrographic Office, Washington, D. C.

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H. O. No. 129

1937 Supplement

A supplement containing information received in the Hydrographic Office from the date of publication of this book to January 1, 1937, will be issued in the early part of the year, and will be sent free of expense upon the receipt of this coupon at the United States Hydrographic Office, Washington, D. C.

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## 1934 Supplement

A supplement containing information received in the Hydrographic Office from the date of publication of this book in January, 1934, will be issued in the early part of the year, and will be sent free of expense upon the receipt of this coupon at the United States Hydrographic Office, Washington, D. C.

Name Address 

## 1935 Supplement

A supplement containing information received in the Hydrographic Office from the date of publication of this book in January, 1935, will be issued in the early part of the year, and will be sent free of expense upon the receipt of this coupon at the United States Hydrographic Office, Washington, D. C.

Name Address 

## 1936 Supplement

A supplement containing information received in the Hydrographic Office from the date of publication of this book in January, 1936, will be issued in the early part of the year, and will be sent free of expense upon the receipt of this coupon at the United States Hydrographic Office, Washington, D. C.

Name Address



H. O. No. 129

1938 Supplement

A supplement containing information received in the Hydrographic Office from the date of publication of this book to January 1, 1938, will be issued in the early part of the year, and will be sent free of expense upon the receipt of this coupon at the United States Hydrographic Office, Washington, D. C.

Name\_\_\_\_\_

Address\_\_\_\_\_

H. O. No. 129

1939 Supplement

A supplement containing information received in the Hydrographic Office from the date of publication of this book to January 1, 1939, will be issued in the early part of the year, and will be sent free of expense upon the receipt of this coupon at the United States Hydrographic Office, Washington, D. C.

Name\_\_\_\_\_

Address\_\_\_\_\_

H. O. No. 129

1940 Supplement

A supplement containing information received in the Hydrographic Office from the date of publication of this book to January 1, 1940, will be issued in the early part of the year, and will be sent free of expense upon the receipt of this coupon at the United States Hydrographic Office, Washington, D. C.

Name\_\_\_\_\_

Address\_\_\_\_\_



H. O. No. 129

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## P R E F A C E

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This publication is a revision of the third edition of H. O. No. 129, West Indian Pilot, Volume II, and is corrected to date (including Notice to Mariners No. 6) of February 9, 1929.

The principal sources of information examined in the preparation of this edition are:

Surveys (1924 to 1926) in the Gulf of Venezuela by the U. S. S. *Niagara*.

United States Coast Pilot, West Indies (Porto Rico and Virgin Islands), 1921, with supplement to April 30, 1923, by the United States Coast and Geodetic Survey.

British Admiralty, "West Indies Pilot, Volume I," 1923, with supplement to May 23, 1923.

British Admiralty, "West Indies Pilot, Volume II," 1920, with supplement to November 14, 1923.

French Hydrographic "Instructions Nautiques, Ocean Atlantique Ouest, Mer des Antilles, Volume II," 1909, with supplement to January 1, 1928.

Netherlands Sailing Directions, "Zeemansgids voor Nederlandsch West-Indië, 1928."

Reports from United States naval vessels.

Reports from officers of the merchant marine.

Information furnished by United States consuls.

Charts, light list, standard books of reference, and various documents in the possession of the department.

In this publication the bearings and courses are true and are expressed in degrees from 0° (north) to 360°, measured clockwise; those bearings which limit the sectors of lights are toward the light.

The directions of winds are the points from which they blow; of currents, the points toward which they set. These directions are true.

The variation of the compass with the annual rate of change may be obtained from H. O. Chart 2406.

The geographical positions (coordinates) which are given at intervals throughout the book are approximate only and are intended to facilitate reference to the charts.

The charts quoted are the largest-scale charts of the locality on issue by the Hydrographic Office. They may be Hydrographic Office (H. O.) or United States Coast and Geodetic Survey (C. S.) charts. (See paragraph "Distribution of charts," p. 6.)

Distances are expressed in nautical miles, 1 mile equaling one minute of latitude.



Soundings are referred to the datum of the charts (see p. 7), and are expressed in fathoms or feet followed by the equivalent in meters to the nearest tenth.

Heights are referred to the plane of reference used for that purpose on the charts (see p. 7) and are expressed in feet, followed by the equivalent in meters to the nearest tenth.

Light and fog signal characteristics are not fully described, and, as a rule, light sectors are not defined; for these details the mariner should consult the Light Lists, which are published at intervals of about a year.

Supplements to the Sailing Directions, containing corrections and additions from various sources, are issued in the early part of each year. The latest supplement to any volume, together with the Notices to Mariners for the current year affecting it, will correct the book to date.

Masters of vessels should seek from pilots, harbor masters, and other local authorities the latest information relative to any special regulations in force in the particular locality visited.

Mariners are requested to notify the United States Hydrographic Office, Washington, D. C., or one of its branch offices, of errors they may discover in this publication or of additional matter which they think should be inserted.

## INFORMATION RELATING TO NAVIGATIONAL AIDS AND GENERAL NAVIGATION

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**THE HYDROGRAPHIC OFFICE** exists for the improvement of the means for navigating safely the vessels of the United States Navy and of the mercantile marine by providing accurate and cheap nautical charts, sailing directions, navigators, and manuals of instruction for the use of all vessels of the United States, and for the benefit and use of navigators generally.

**THE PUBLICATIONS** of the Hydrographic Office for the use of mariners are: Charts; Sailing Directions; Light Lists; Radio Aids to Navigation; Notices to Mariners; Hydrographic Bulletin; Daily Memorandum; Pilot Charts; American Practical Navigator; Useful Tables from the American Practical Navigator; Star Identification Tables; Azimuths of the Sun; Azimuths of Celestial Bodies; Arctic Azimuth Tables; Altitude, Azimuth, and Line of Position Tables; Noon Interval Tables; The Summer Line of Position Tables; International Code of Signals; Development of Great Circle Sailing; and Table of Distances Between Ports. (See General Catalogue.)

**Sailing Directions or Pilots** are books treating of certain divisions of the navigable waters of the globe. They contain descriptions of coast lines and harbors; dangers; information of winds, currents, and tides; directions for approaching and entering harbors; and much other information of interest to mariners that can not be shown on charts or is not given in other Hydrographic Office publications.

The Sailing Directions are corrected, so far as practicable, to the date of issue from the office; subsequently the mariner should avail himself of the annual supplements which will be mailed on receipt of the coupon included for that purpose in the front of each volume. The more important corrections for the current year are published in the Notices to Mariners and should be inserted on the proper pages of the volumes of Sailing Directions affected.

These Sailing Directions are published in 56 separate volumes, whose title and limits are listed in the back of this book. The coasts of the United States and its possessions are covered by Coast Pilots published by the United States Coast and Geodetic Survey; these pilots are issued by the Hydrographic Office to vessels of the United States Navy only.

**Light Lists** give detailed information of the position and character of lights, with a brief description of the lighthouses and of any accompanying fog signals. These publications, consisting of six volumes, revised annually, contain the latest available information of the lights of the world, except those of the United States and Alaska, and should always be consulted when information of lights is desired. They should be kept corrected to date by inserting at the appropriate places corrections published in Notices to Mariners.

Similar publications giving full information of lights of the United States and its possessions are published by the Lighthouse Service and are issued by the Hydrographic Office to vessels of the United States Navy.

**Radio Aids to Navigation**, Hydrographic Office Publication No. 205, lists those radio stations throughout the world which perform services of value

to navigation. It includes details of radio-compass stations, radiobeacons, weather bulletins, storm and navigational warnings, time signals, etc. For traffic stations the mariner should consult the International List of Radiotelegraph Stations (obtainable from the International Office of the Telegraph Union, Berne, Switzerland).

**Azimuths of the Sun**, Hydrographic Office Publication No. 71, contains tables giving the true bearings of the sun at intervals of 10 minutes between sunrise and sunset between  $71^{\circ}$  N. and  $71^{\circ}$  S. This table can be applied to the moon, planets, and stars when their declinations do not exceed  $23^{\circ}$  N. or S.

**Azimuths of Celestial Bodies**, Hydrographic Office Publication No. 120, contains tables giving the true bearings of celestial bodies whose declinations range from  $24^{\circ}$  to  $70^{\circ}$  for parallels of latitude extending to  $70^{\circ}$  from the Equator; these tables are a continuation of the tables given in the *Azimuths of the Sun*, and the two books together will furnish the azimuth of any body whose declination does not exceed  $70^{\circ}$ .

**Arctic Azimuth Tables**, Hydrographic Office Publication No. 66, gives true bearings of the sun and other celestial bodies ranging in declination from  $0^{\circ}$  to  $23^{\circ}$  of the same name as the latitude for parallels of latitude from  $70^{\circ}$  to  $88^{\circ}$ , both inclusive. The true bearings are given at intervals of 10 minutes for 6 hours out of the 24; that is (in the case of the sun), from 5 a. m. to 8 p. m. and from 4 p. m. to 7 p. m. The tables are applicable in both the Northern and Southern Hemispheres.

**Altitude, Azimuth, and Line of Position Tables**, Hydrographic Office Publication No. 200, contains the tables necessary for working a sight of a heavenly body for a line of position, using the cosine-haversine formula and Aquino's Altitude and Azimuth Tables. In addition, it contains tables for the corrections to be applied to observed altitudes of the sun, moon, stars, or planets, so that a mariner supplied with this book and a Nautical Almanac is equipped to work a sight and plot a line of position by either method.

**Noon Interval Tables**, Hydrographic Office Publication No. 202, affords a means of finding without computation the interval to noon from the morning time sight. They are useful in ascertaining the vessel's run to noon and the local apparent time of noon.

**The Summer Line of Position Tables**, Hydrographic Office Publication No. 203, contains tables by which the hour angle and azimuth of a celestial body may be obtained by inspection and interpolation to lay down the Summer line readily. They are arranged for use in the zone between latitude  $60^{\circ}$  N. and  $60^{\circ}$  S., employing the celestial bodies whose declinations do not exceed  $27^{\circ}$ . They are also available for use in the zone between latitude  $27^{\circ}$  N. and  $27^{\circ}$  S. for bodies whose declinations do not exceed  $60^{\circ}$ .

These tables are continued in Hydrographic Office Publication No. 204, which gives simultaneous hour angle and azimuth of celestial bodies between  $27^{\circ}$  and  $63^{\circ}$  of declination from the celestial equator, for latitudes ranging from  $60^{\circ}$  N. to  $60^{\circ}$  S.

**Navigation Tables for Navigators and Aviators**, Hydrographic Office Publication No. 208, gives a quick method for solving all navigational problems regardless of the position of the heavenly body, be it sun, moon, planet, or star. The accuracy of the azimuth data fully justifies its use in obtaining compass error. The tables are simple to use.

**Star Identification Tables**, Hydrographic Office Publication No. 127, gives the simultaneous values of declination and hour angle for values of latitude, altitude, and azimuth ranging from  $0^{\circ}$  to  $80^{\circ}$  in latitude and altitude and from  $0^{\circ}$  to  $180^{\circ}$  in azimuth. These tables enable the navigator, knowing the approximate

position of the vessel, to identify stars of the first magnitude by observing their bearing and altitude.

**Table of Distances**, Hydrographic Office Publication No. 117, gives the shortest navigable distances between ports. Where more than one route exists the name and distance over the most practicable one are given. Due to the factor of safety used by the Hydrographic Office in clearing danger and changing courses, the distances given in this book may differ by a few miles from those obtained by different computations.

**American Practical Navigator (Bowditch)**, Hydrographic Office Publication No. 9, is a complete treatise on navigation, including the tables necessary in navigation with directions for their use. It includes chapters on kindred subjects, such as tides, marine surveying, winds, and ice. For the convenience of navigators the tables are reproduced in a separate and less bulky volume, called "**Useful Tables from the American Practical Navigator.**"

**The Development of Great Circle Sailing**, Hydrographic Office Publication No. 90, is an exposition of the principles relating to great-circle sailing and their practical application as developed by certain cartographers in great-circle charts.

**International Code of Signals**, Hydrographic Office Publication No. 87, describes the methods used in the International Code and is divided into three parts. The first part contains urgent and important signals and all the tables of money, weights, barometric heights, etc., together with a geographical list and a table of phrases formed with the auxiliary verbs.

The second part is a signal index. It consists of a general vocabulary and a geographical index, arranged alphabetically.

The third part gives lists of the storm warning, Coast Guard, time signal, radio, and radio time signal stations of the United States and of Lloyd's signal stations of the world.

It also contains semaphore and distant signal codes, the United States Army and Navy dot-and-dash and semaphore codes, and the Morse signal code.

**Notices to Mariners**, containing newly acquired information relating to various parts of the world, are published weekly and mailed to all United States vessels in commission, branch hydrographic offices and agencies, and United States consulates. Copies are furnished free by the Hydrographic Office or by any of its branch offices on application.

The Hydrographic Office undertakes by means of the Notice to furnish to navigators the most essential corrections to publications which it has issued or sold.

With each Notice there is also furnished to naval vessels a separate sheet giving the items relative to lights contained in the latest Notice and necessary to correct the Light Lists.

**Pilot Charts** of the North Atlantic, Central American waters, North Pacific and Indian Oceans are issued each month and of the South Atlantic and South Pacific Oceans each quarter. These charts give in graphic form available facts or conclusions from hydrography, navigation, and meteorology that will assist the mariner to choose the safest and quickest routes. Besides timely information of a varied nature, their principal features are: Average winds, currents, barometer, and percentage of gales, calms, and fog; presence of ice and derelicts; governmental radio stations open to public correspondence; isothermic lines; lines of equal variation of the compass for each degree and their annual change; and routes for steamers and sailing vessels. They are furnished in exchange for marine data or observations.

**Hydrographic Bulletin**, a weekly publication which supplements the Pilot Charts contains late reports of ice, derelicts, important aids to navigation, and miscellaneous facts of use and interest to navigators. During dangerous ice conditions it is accompanied by a small chart which shows the North Atlantic lane routes and recently reported ice in the North Atlantic. The Bulletin contains information of all oceans and of the Great Lakes. It may be obtained free upon application.

**Daily Memorandum** is a daily publication which carries a synopsis of all important information relating to dangers and aids to navigation, including reports of ice, derelicts, etc., received up to 4 p. m. of the day of issue. It is circulated chiefly to the branch hydrographic offices. Its most urgent reports are also broadcast by radio.

**CHARTS.**—Charts are representations of land and water on a flat surface, prepared for the use of the mariners.

On account of the curvature of the earth it is impossible to give an accurate representation on a flat surface, and this has led chart constructors to use various projections, all being somewhat distorted but sufficiently accurate for the purpose of navigation.

The projections most used by chart constructors are the Mercator, the polyconic, and the gnomonic or great circle. Each projection has certain properties which adapt it to particular uses.

**Mercator charts** are the most convenient for navigational purposes. On a Mercator chart the shapes of small areas are but little distorted; latitudes and longitudes can be plotted easily and accurately; the vessel's track is a straight line, and the angle this line makes with any meridian is the course.

However, the observed bearings are not identical with those laid down upon a Mercator chart, except the bearings north and south and east and west on the Equator, for the line of sight, except as affected by refraction, is a straight line and lies in the plane of the great circle, while the straight line on the chart, except the meridian line, represents not the arc of a great circle but the loxodromic curve or rhumb line, which on the globe is a spiral approaching but never in theory reaching the pole. This difference is not appreciable with near objects and in ordinary navigation, but in high latitudes the bearings of distant objects, especially those lying nearly east or west, must be corrected for the convergence of the meridians before they can be used on a Mercator chart; consequently Mercator charts are rarely used in polar regions.

**Polyconic charts** have practically no distortion along the middle meridian, are well adapted to all latitudes, represent the areas of regions correctly, and permit a single scale of distances.

The meridians and parallels on polyconic charts are curved, the rhumb line is curved, and there is slight distortion as the longitude departs from the middle meridian.

**Gnomonic or great circle charts** are useful for obtaining the great circle course and distance and for navigating in high latitudes where the Mercator projection fails. In this projection great circles appear as straight lines. There is distortion on these charts at points some distance from the point of tangency of the plane of projection, and on them the rhumb line is curved.

The polar chart, a special form of the gnomonic projection designed for use in the polar regions, is so constructed that the point of tangency is at the pole; the rhumb line is spiral.

The accuracy of any chart depends upon the character and the thoroughness of the original survey and the completeness of the information received of sub-

sequent changes. Hydrographic Office charts are based upon the most reliable surveys obtainable and are corrected from time to time from information received from reliable sources.

The sources and date of survey are given in the title, and the dates of extensive corrections and minor corrections are shown on the chart.

Many of the earlier surveys were incomplete and inaccurate, and charts based only upon them carry the resulting errors, until later information or a resurvey furnishes the necessary corrections; so charts based on old surveys should be used with caution.

In general, it may be assumed that only surveys of well-frequented ports and their approaches have been completed and are thorough enough to discover every danger.

Information in regard to remote places is always scanty, and sometimes entirely lacking; therefore charts of these places can not always be kept up to date, and should be used accordingly.

In river deltas, particularly those with mud bottoms, the channels shift from time to time and the local authorities usually change the buoyage to correspond. It is difficult to keep charts of such places correct at all times.

The number of soundings on a chart is an indication of the completeness of the survey, but for the sake of clearness a chart is not expected to show every sounding taken. Sparse or unevenly distributed soundings indicate that the survey was not made in detail. Blank spaces among soundings indicate that no soundings were obtained, and it may generally be assumed when the near-by or surrounding soundings are deep that in the blanks the water is also deep; but among shallow soundings or near reefs all blank spaces must be regarded with suspicion.

A complete and detailed survey may fail to find every patch or pinnacle rock, particularly among coral regions, off rocky shores, and in waters where rocks abound. A coast line can always be assumed foul unless it is shown to be clear.

**Fathom curves as a caution.**—The necessities of navigation do not require, and as yet have failed to provide, detailed surveys of the general coasts, and on most charts the 5 fathom (9.1 m.) curve may be considered a danger curve inside of which it is not wise to venture unnecessarily.

On rocky shores or with deep-draft vessels it is well to regard the 10 fathom (18.3 m.) curve as such a danger curve.

A useful danger curve on well-surveyed coasts can be obtained by tracing with a colored pencil or ink the curve of depth next greater than the draft of the vessel using the chart; the edge of the sanding is a well-marked danger line for vessels of less than 18 feet (5.5 m.) draft.

Charts of localities where soundings are scarce and the bottom uneven, so that curves of equal depths can not be drawn accurately or at all, should be used with caution.

Where an isolated sounding shows less water than surrounding depths, especially when marked with a dotted ring, it should be avoided, as the spot may not have been thoroughly examined or the least depth found.

The chart on the largest scale should always be used on account of its greater detail and the greater accuracy with which positions may be plotted on it. When approaching land or dangerous banks the mariner should change from the small-scale chart to the chart on the largest scale in ample time to plot the best possible fix of the vessel.

Notes on charts should be read with care, as they may give important information that can not be graphically represented.

**Current arrows on charts** show only the most usual or the mean direction of a current; it must not be assumed that the direction of a current will not vary from that indicated by the arrow. The velocities of currents also vary with circumstances, and those given on the charts are merely the mean of those determined, possibly from very few observations.

**Compass roses on charts.**—The change in the variation from year to year gradually introduces an error in the magnetic compass roses on charts. In some localities there is a large annual change, and with a small-scale chart failure to correct a course or bearing for this change will give an incorrect position. The date of the variation and the annual change are given on the compass rose; this information readily permits the conversion of magnetic courses and bearings into true and facilitates the use of the true compass rose, which is the best practice.

In some parts of the world the variation changes so rapidly with a change of position that frequent changes of compass course are necessary to maintain a true course. For example, in approaching New York from Liverpool on the great circle course the variation changes over  $10^\circ$  in less than 600 miles.

**Local magnetic disturbance of the compass.**—Magnetic masses of minerals, external to a vessel, exert an effect on the compass known as "local magnetic disturbance" or "local attraction." Such disturbance of the compass in vessels at sea is sometimes experienced in different parts of the world. The adjacent land is probably not the cause of the disturbance, because the effect of a magnetic force decreases so rapidly with distance that it would require a local magnetic center of a force hitherto unknown to affect a vessel's compass, even a short distance away. Magnetic minerals at the bottom of the sea under the vessel probably cause these deflections of the compass, perhaps with strong force in shallow water. The compass may be disturbed when steaming over such a spot, but the disturbance will only extend over a small space unless there are many magnetic centers close together.

**Distribution of charts.**—The Hydrographic Office prepares, issues to the United States Navy, and sells to mariners, direct or through its agents, Mercator charts for general navigation, a great circle chart of each ocean, and a polar chart of the north polar region. To the United States Navy only it issues United States Coast and Geodetic Survey charts, some Mercator, some polyconic, of the coasts of the United States and its possessions, and such other charts, mainly those of the British Admiralty, as are necessary.

All charts issued by the Hydrographic Office are corrected to date of issue and stamped to that effect on the face of the chart.

The date of original publication is carried at the middle of the lower margin, the edition (extensive corrections) is noted at the right, and the date of printing (small corrections) at the left.

The General Catalogue of **Mariners' Charts and Books** published by the Hydrographic Office is issued to all naval vessels when commissioned and to all merchant vessels upon request.

The catalogue of charts issued by the Coast and Geodetic Survey is furnished to all naval vessels by the Hydrographic Office and may be obtained by all other mariners directly from the Coast and Geodetic Survey.

**TIDES.**—A knowledge of the times of high and low water and of the amount of vertical rise and fall of the tide is of great importance in the case of vessels entering or leaving port, especially when the low water is less than or near their draft. Such knowledge is also useful at times to vessels running close along a coast, in enabling them to anticipate the effect of the tidal currents in

setting them on or off shore. This is especially important in fog or thick weather.

**Planes of reference.**—The plane of reference for soundings on Hydrographic Office charts made from United States Government surveys and on United States Coast and Geodetic Survey charts of the Atlantic coast of the United States is mean low water; on the United States Coast and Geodetic Survey charts of the Pacific coast of the United States, the Hawaiian Islands, the Philippines, and Alaska it is the mean of the lower low waters; on United States Hydrographic Office charts of the coast from Puget Sound to Alaska it is low water ordinary springs.

The plane of reference for British Admiralty charts, based on British surveys, is, in waters where the daily inequality is small, the level of mean low-water springs, and in places where the daily inequality is considerable the level of Indian spring low water, which is approximately the lowest possible low water, and therefore corresponds closely to the mean of the lower low waters at places having a large daily inequality.

The plane of reference for United States Hydrographic Office charts and for British Admiralty charts, based on charts of other nations, is that used by the original authority.

The plane of reference of Denmark, Norway, and Japan is mean low water springs, of Holland is mean low water, of Germany is a definite distance below mean low water springs, and of France and Spain is the lowest low water.

The plane of reference may be in doubt on charts compiled from old or various sources, and in such case, or whenever not stated on the chart, the assumption that the reference plane is mean low water and not low water ordinary springs gives a larger margin of safety. There are times when the tide may fall below any plane of reference that is used on the chart. Low water is lower than mean low water about half the time, and when a new or full moon occurs at perigee the low water is lower than the average low waters of springs. On the coast of Europe the spring range is increased at the equinoxes, but in some other parts of the world, especially those places having a large daily inequality, such periodic low tides occur at the solstices.

The water may fall at times below even a very low plane of reference, owing to the wind or to a high barometer.

Much daily inequality in the tides of certain coasts causes the amount of rise and fall to be unreliable, and additional caution must be used; also the establishment for such places can not be considered reliable.

The International Hydrographic Conference of 1919 recommended for future consideration a uniform reference plane for all nations to be called "International low water."

**Mean sea level.**—The depths at half tide are practically the same for all tides, whether neaps or springs. Half tide, therefore corresponds with mean sea level. This makes a very exact plane of reference, easily found, to which it would be well to refer all high and low waters.

If required to take special soundings for the chart at a place where there is no tidal bench mark, mean sea level should be found and the plane for reductions established at the proper distance below it, as ascertained by the Tide Tables, or by observations, or in some cases, if the time be short, by estimation, the data used being made a part of the record.

**Planes of reference for heights.**—The plane to which heights on the Hydrographic Office charts are referred is usually the plane used by the original survey upon which the charts are based. There is little uniformity in this datum plane among the charts published by the various maritime countries.



though mean sea level or some plane of high water is more usual. In the case of lights, however, the figures given on the Hydrographic Office charts, as also in its other publications, have been corrected, in all areas where the tidal range is appreciable, to read above some plane of high water.

**Tidal currents.**—In navigating along coasts where the tidal range is considerable, special caution is necessary. It should be remembered that there are generally indrafts and corresponding outdrafts abreast of all large bays and bights, although the current may generally run nearly parallel with the shore outside of the entrances.

The turn of the tidal current offshore seldom coincides with the time of high and low water along the shore. In some channels the tidal current may overrun the turn of the vertical movement of the tide by three hours, so that at high and low water by the shore the current is running at its greatest velocity.

The effect of the tidal wave in causing currents may be illustrated by two cases:

(1) Where there is a small tidal basin connected with the sea by a large opening.

(2) Where there is a large tidal basin connected with the sea by a small opening.

In the first case the velocity of the current in the opening will have its maximum value when the height of the tide within is changing most rapidly; i. e., at a time about midway between high and low water. The water in the basin keeps at approximately the same level as the water outside. The flood current corresponds with the rising and the ebb current with the falling of the tide.

In the second case the velocity of the current in the opening will have its maximum value when it is high water or low water without, for then there is the greatest head of water for producing motion. The flood current in such cases generally begins about three hours after low water and the ebb current about three hours after high water, slack water thus occurring about midway between the tides.

Along most shores not much affected by bays, tidal rivers, etc., the current usually turns soon after high water and low water.

The swiftest current in straight portions of tidal rivers is usually in the middle of the river, but in curved portions the most rapid current is toward the outer edge of the curve, and here the deepest water will generally be found. The pilot rule for best water is to follow the outer edge of the curves or the ebb tide reaches.

Countercurrents and eddies may occur near the shores of straits, especially in bights and near points. A knowledge of them is useful in order that they may be used or avoided.

A swift current often occurs in a narrow passage connecting two large bodies of water, owing to their considerable difference of level at the same instant. The several passages between Vineyard Sound and Buzzards Bay are cases in point.

Tide rips are generally made by a rapid current setting over an irregular bottom, as at the edges of banks where the change of depth is considerable, but current rips sometimes occur on the high seas.

Tide Tables, published annually by the United States Coast and Geodetic Survey, give the predicted times and heights of the high and the low waters for every day in the year at 88 of the principal ports of the world, and from these, by means of tidal differences and ratios, at a very large number of

subordinate ports. The tables for the Atlantic and the Pacific coast ports of the United States are also published separately. These tables predict the times of high and low water, and not the times of turning of the current or of slack water, which may be quite different.

The distinction between "rise" and "range" of the tide should be understood. The former expression refers to the height attained above the datum plane of sounding, differing with the different planes of reference; the latter, to the difference of level between successive high and low waters.

Full explanations and directions for using the tide tables are given in that book.

Current tables are published annually by the United States Coast and Geodetic Survey in the form of two pamphlets. The tables for the Atlantic coast of North America give the predicted times of slack water for each day of the year for a number of stations from the Bay of Fundy to Florida, together with time differences for slack water at subordinate stations and other current information for the area. The tables for the Pacific coast of North America give similar information for a number of stations from Lower California to Alaska.

**AIDS TO NAVIGATION**—Lights.—Charts and Light Lists give the visibility of lights for a height of 15 feet (4.6 m.) of the observer's eye, and the effect of a greater or less height of the observer's eye can be obtained by the tables of distances published in all of the Light Lists.

A light is sooner sighted aloft, as there the observer's range of vision is increased, and an approximate bearing of the light may be obtained by noting while aloft a star, over or nearly over the light, and later observing the bearing of the star with the compass.

Powerful lights often loom far beyond the limit of visibility of the actual rays of the light, and this must not be confounded with the true range. Refraction also often causes a light to be seen farther than under normal conditions.

On first sighting a light, by at once lowering the eye several feet and noting whether the light is made to dip, it may be determined whether the vessel is on the circle of visibility corresponding with the usual height of the eye or unexpectedly near the light.

When expecting to sight a light in thick weather, its power and color should always be considered. Haze obscures a weak or a colored light and decreases the chance of sighting it.

The distance from a light can not be estimated either by its brilliance or by its dimness, but only by its change of bearing.

When a light is sighted it should be identified at once by carefully checking its characteristics as given in the Light List, particularly when approaching a well-lighted coast, where lights with similar characteristics are sometimes found close together.

The power of a light can be estimated by its candlepower as given in the Light List, and in some cases by noting how much its visibility in clear weather falls short of the range corresponding to its height. For example, a light elevated 120 feet (36.6 m.) above high water and visible only 9 miles in clear weather must be of small candlepower, for if of sufficient candlepower its height would give it a visibility of over 16 miles.

**Buoys.**—Buoys do not always maintain exact positions; therefore they should always be regarded as warnings and not as fixed navigational marks, especially during the winter months or when moored in exposed waters. A vessel's position should, when possible, be plotted not by buoys but by bearings or by angles of fixed objects on shore.

Light buoys can not always be relied on, because the light may become extinguished, or, if periodic, the apparatus may fail to operate.

Whistle and bell buoys are sounded by the action of the sea; therefore in calm weather they are less effective, and at times may not sound.

**NAVIGATION.**—**Piloting**, in the modern sense of the word, is the art of conducting a vessel in channels and harbors and along coasts where landmarks and aids to navigation are available for fixing the position and where the depth of water and dangers to navigation require a constant watch and frequent changes of course. Piloting requires the greatest experience and nicest judgment of any form of navigation. An error in position on the high seas may be rectified by later observations, but an error in position while piloting often results in disaster. Therefore the mariner should endeavor to be proficient in this important branch, mindful that a modern well-found vessel is usually safe on the high seas and in danger when approaching land and making harbor.

In planning to enter a strange port the mariner should give careful previous study to the chart, sailing directions, and tide tables, and should select the most suitable marks for use, providing substitutes in case those selected can not be recognized with absolute certainty. Ranges should be noted if available and the lines drawn on the charts both for leading through the deepest water in channels and for guarding against particular dangers; for the latter purpose safety bearings should in all cases be laid down when no suitable ranges offer. The courses to be steered in entering should be laid down and distances marked thereon.

If intending to use the sextant and danger angle in passing dangers, and especially in passing between dangers, the danger circle should be plotted and regular courses planned, rather than to run haphazard by the indication of the angle alone, with possible trouble from bad steering at critical points.

It should be remembered that channel buoys seen from a distance are difficult to identify, because their color is sometimes not easily distinguished, and they may appear equally distant from the observer even when at widely varying distances.

The vessel's position should be fixed at all times, even when entering ports considered safe and easy of access, and should be constantly checked, using for the purpose those marks whose identity has been established beyond doubt.

The vessel should ordinarily steer exact courses and follow an exact line as planned from the chart, changing course at precise points; and, where the distance run on the same course is considerable, the position should be checked at frequent intervals. This procedure is desirable even when it may seem unnecessary for safety, because if running by the eye alone, and the vessel's exact position be immediately required, as in a fog or sudden squall, a fix at that particular moment may be difficult to obtain.

This habit of running exact courses with precise changes of course will also be found most useful when it is desired to enter port or pass through inclosed waters by means of the buoys alone, as during a fog; here safety demands that the buoys be made successively, which requires, if the fog be dense, very accurate courses and careful attention to the speed of the vessel and the set of the current; failure to make a buoy when expected leaves, as a rule, no safe alternative but to anchor at once, with perhaps a consequent serious loss of time.

Changes of course should in general be made by exact amounts, naming the new course or the amount of the change desired, rather than by ordering the rudder to be put over and then steadying when on the desired course, with

the danger of the attention being diverted and of forgetting that the vessel is still swinging. The helmsman, knowing what is desired and the amount of change to be made, is able to act more intelligently and to steer a good course, which is essential in narrow channels.

In passing between dangers where there are no suitable ranges, as, for instance, between two islands or an island and the main shore when the conformations of the shore line are very similar, with dangers extending from both, a midchannel course may be steered by the eye alone with great accuracy, as the eye is able to estimate very closely to the line that lies midway between.

In piloting among coral reefs or banks a time should be chosen when the sun will be astern, conning the vessel from aloft or from an elevated position forward, for the line of demarcation between the deep water and the edges of the shoals is indicated with surprising clearness.

Coast piloting involves the same principles as piloting in a harbor or channel, and similarly requires that the vessel's position be continuously determined as landmarks are passed.

The routes should be planned for normal conditions of weather, with suitable variations in case of fog or bad weather or for making points at night.

On well-surveyed coasts there is a great advantage in coasting near the land, keeping the marks and the soundings, and thereby knowing at all times the vessel's position, rather than keeping offshore and losing the marks, with the necessity of again making the land from a doubtful position, with perhaps the added inconvenience of fog or bad weather.

The danger circle for either the horizontal or the vertical danger angles should be plotted wherever the method can be usefully employed and the angles should be marked on the chart. This practice will save many miles in rounding dangerous points, with no sacrifice of safety. Where available, ranges should also be marked on the chart, either to lead clear of dangers or to check the deviation of the compass.

In making a coastwise trip against a strong offshore or head wind, it may be desirable, with trustworthy charts, to skirt the shore as closely as possible in order to avoid the heavier seas and adverse currents that prevail farther out. In some cases, with small vessels, a passage can be made only in this way. The important saving of fuel and of time thus effected by skillful coast piloting makes this subject one of prime importance to the navigator. Many vessels attempting to save time or distance approach dangers too closely and get into trouble, so a mariner should always remember that the safety of the vessel is the first consideration.

In case of regular runs over the same route, the courses and distances should be entered in a notebook and laid down on the chart where they will be available for ready reference.

The officer of the watch should keep a continuous record of the progress of the vessel, entering in the navigator's notebook and ship's log book the time and patent log reading of all changes of course and the bearings of objects, especially when abeam. In this way reckoning is regularly kept without the presence or particular order of the captain or navigating officer. The fresh and exact position thus available is useful at all times, and is particularly valuable at night or in case of a sudden squall or fog.

**Fixing position.**—A navigator in sight of objects, which are recognizable and are shown on the chart, may fix his position by any of the following methods:

1. Sextant angles between three known objects.
2. Bearings of a known object and the angle between two known objects.
3. Cross bearings of two or more known objects.

4. Two bearings of a known object, separated by an interval of time, with the run during the interval.

5. Bearing and distance of a known object.

Besides the foregoing there are three methods by which, without obtaining the precise position, the navigator may assure himself that he is clear of any particular danger. They are—

1. By following a range.
2. By using the danger angle.
3. By using the danger bearing.

These various methods are fully explained in most textbooks on navigation and in the American Practical Navigator, a copy of which should be in the navigator's outfit.

The existing conditions will usually determine the method to be used, but where there is a choice the method that will assure the most accurate fix should be employed.

**Deep-sea navigation.**—At sea the position of the vessel may be determined by "dead reckoning" or by observations of heavenly bodies. There are several methods used in obtaining the "dead reckoning" position and various formulas used to obtain position by observation. The American Practical Navigator gives full description of these methods and should be consulted by the mariner.

The method which should be thoroughly understood and regularly used is that employing position or Sumner lines. H. O. Publications Nos. 203 and 204 (simultaneous hour angle and azimuth tables) and No. 208 (Navigation Tables for Navigators and Aviators) offer convenient methods of obtaining a line of position either by computation or inspection.

Lines of position, however obtained, give the most comprehensive information to the navigator with the least expenditure of labor and time. After working a line of position and plotting it on the chart, the mariner knows the vessel must be somewhere on the line, provided the data used be accurate and the chronometer correct. As the information given by one line of position is not enough to determine the definite location of the vessel, it is necessary to cross this line by another similarly obtained, and the vessel, being somewhere on each, must be at their intersection.

A single line will at times furnish the mariner with valuable information. For instance, if it points toward the coast it marks the bearing of a definite point on the shore, or, if parallel to the coast, it clearly indicates the distance off, and so will often be found useful as a course. When the heavenly body is abeam, the line of position will be parallel to the vessel's course and will indicate whether the vessel is on the course or the distance away from the course. When the heavenly body is ahead or astern, the line of position will be at right angles to the course and will indicate whether the vessel is ahead or astern of the position by "dead reckoning."

A sounding taken at the same time as the observation will under certain conditions prove of great value in giving an approximate position on the line.

**Crossing two lines.**—A very accurate position can be obtained by observing two or more stars at morning or evening twilight, at which time the horizon in clear weather is well defined. The position lines thus obtained will, if the bearings of the stars differ 30° or more, give an excellent fix. A star or planet at twilight and the sun afterwards or before may be combined; also two observations of the sun with sufficient interval to admit of a considerable change of bearing; in these cases one of the lines must be moved for the run of the vessel.

**Navigation in a fog.**—In spite of all aids to navigation, closing the land in a fog is attended with danger, and a mariner approaching the shore in a fog should first consider whether the necessity to continue is sufficiently great to justify the certain risk involved. In addition to the dangers of navigation, grave risk of collision exists in a fog, a discussion of which is not within the province of this book, but which must be duly considered by the mariner in deciding whether to enter a harbor or narrow waters during a fog. A mariner is often overtaken by a fog in narrow waters, under which circumstances there is no choice but to proceed.

If the urgent nature of the voyage justifies the attempt or if circumstances force the vessel to continue, the mariner should proceed with caution, taking advantage of all aids to navigation.

**Taking soundings in a fog.**—Soundings at regular and frequent intervals should be taken and the depths and the character of the bottom obtained. The depths should be placed on tracing paper on the same scale as the chart and on the course steered by the vessel, and the tracing paper moved over the chart, keeping the line representing the vessel's track parallel with the course until the observed soundings and character of bottom agree, or nearly agree, with those given on the chart, which procedure will determine the ship's position fairly accurately. At least it will give a good indication of the position.

After entering a channel or fairway marked by buoys or other aids, endeavor to sight each buoy or aid in succession; and if unsuccessful, anchor, for in narrow waters it is usually unsafe to proceed after missing a buoy.

**Aids to navigation in a fog.**—Bell buoys, whistle buoys, foghorns (either operated by compressed air or by hand), sirens, steam whistles, explosions (usually from a gun), all depend upon the transmission of sound through the air and are sometimes unreliable, because sound travels through the air in a variable manner. Apart from the influence of the wind and with no apparent reason, large zones of silence often occur at varying directions and different distances from the origin of a sound, so entire dependence can never be placed upon these fog signals.

The wind may throw the sound up or down, depending upon circumstances, so lookouts should be stationed aloft, on the bridge, and on deck.

A fog sometimes creeps imperceptibly shoreward, unobserved at first by the lightkeeper, while a vessel enveloped in the fog confidently approaches the land, depending upon a signal which is not being sounded.

**Echoes.**—In many inland passages, where the channels are narrow, or along certain coasts which are hilly and mountainous, such as occur in southeastern Alaska, it may prove useful in a fog to sound a whistle or siren and to estimate the distance offshore by the loudness or faintness of the echo as it reverberates from the sides of the hills or mountains.

**Submarine bells.**—Many light vessels are equipped with submarine bells, which are heard farther and with greater certainty than signals sounded in the air, and a vessel equipped with receiving apparatus may determine the approximate bearing of the signal. The chance of the keeper not sounding the signal exists in any system, however, and must be remembered. These signals may be heard on vessels not equipped with receiving apparatus by observers listening at the skin of the ship below the water line, but the bearing of the signal can not be as readily determined.

Vessels equipped with radio and submarine sound receivers may fix their distance from a light vessel having radio and submarine transmitters by utilizing the difference in velocity of radio waves and sound waves through water.

Sound travels 4,794 feet per second at 66° F. in water, and the travel of radio waves for practicable distances may be taken as instantaneous.

The radiocompass, aboard ship or on shore, is a most valuable aid when closing the land in a fog.

**Aboard ship** the radio compass furnishes the navigator with the relative bearings of the radio stations whose incoming waves are observed. Any radio transmitter within range and of known position thus serves as a radio beacon upon which bearings can be taken, and in addition there are available in a number of places automatic radio fog signals, which, particularly during foggy weather, send out distinctive signals at regular intervals.

**Shore stations.**—In approaching land during a fog the nearest radiocompass station should be requested to furnish bearings. Usually there will be two or more stations available which will supply through a control station simultaneous bearings of the vessel from the different stations, thus enabling the mariner to plot the vessel's position. These bearings can be furnished at frequent intervals, and the position continuously checked.

Where only one radio-compass station is available, the mariner may fix his position by a group of bearings from the station with the distance run between, or may use bearings as lines of position.

**Accuracy of bearings.**—Correctly calibrated radio compasses located on shore should have an average error of not more than 2°, but this means the average of a large number of bearings. With the ship radio compass this average error may be as much as 6°, or even more, depending very much upon the location, the facility of determining the ship's head at the instant of observation, or the certainty on the part of the operator that all ship's antennae were open, etc. Attention is especially invited to the fact that with an average error of 6°, or even 2°, the maximum error for any one individual bearing may be very much in excess of that figure. It is for this reason that any one bearing must always be used with caution, and the knowledge of this fact on the part of those who employ the bearings is indispensable.

All radio bearings are great circles, and before plotting them on a Mercator chart at distances greater than 50 miles they require a minor correction. Rules for the application of this correction are contained in H. O. Publication No. 205.

**Uniform system of time keeping at sea.**—A uniform system of time keeping at sea, as described hereafter, has been adopted by the navies of the principal maritime countries.

This system is intended to insure vessels at sea within certain defined limits of longitude keeping the same time in a similar manner to that now used on land. The ship's clock will therefore now be set to show the time of a definite hourly meridian, instead of being set to an indefinite time selected by the ship.

The surface of the globe is conceived to be divided into 24 staves or zones, each bounded by meridians 15 degrees of arc or 1 hour of time apart in longitude. The initial zone is the one which has the meridians of Greenwich running through the middle of it, and the meridian 7½° east of Greenwich and 7½° west of Greenwich marking its eastern and western limits; it is called the zero zone, because the difference between the standard time of this zone and Greenwich civil time is zero. And each of the zones in turn is designated by a number representing the number of hours by which the standard time of the zone differs from the Greenwich civil time.

The zones lying in east longitude from the zero zone are numbered in sequence from 1 to 12 and are called minus zones, because in each of them the zone number must be subtracted from the standard time in order to obtain the Greenwich civil time. The zones lying in west longitude from the zero zone

are likewise numbered in sequence from 1 to 12 and are called plus zones, because in each of these zones the zone number must be added to the standard time in order to obtain the Greenwich civil time.

The twelfth zone is divided medially by the one hundred and eightieth meridian (the line separating the meridians of east longitude from the meridians of west longitude), and the terms "minus" or "plus" are used in this zone.

The number of zone prefixed by the plus sign, thus +, or by the minus sign, thus —, constitutes the "zone description" of the time of that zone.

In the vicinity of the land the boundaries between zones are modified so as to be in accord with the boundaries of the countries or regions using corresponding times. In actual practice the boundaries of time zones on land are determined by the frontiers of countries, and agree generally with those at sea which are now defined by the meridian of  $7\frac{1}{2}^{\circ}$ ,  $22\frac{1}{2}^{\circ}$ , etc., except when modified as necessary by the territorial limits of the countries concerned.

A graphic representation of this system will be found on Chart 5192, Time Zone Chart of the World, published by the Hydrographic Office.

**Use of oil for modifying the effects of breaking waves.**—Experience has proved the usefulness of oil in modifying the effect of breaking waves and has developed simple and effective methods of using it.

The principal facts developed to date are:

(1) The heaviest and thickest oils, notably animal and vegetable oils, are the most effective. Crude petroleum is serviceable and should be used when no better oil is available; it may be improved by mixing with other oils. Refined kerosene is of little value.

(2) In cold weather oils thicken and do not spread freely. This tendency to thicken may be reduced by thinning a heavy, sticky oil with petroleum.

(3) A small quantity of oil suffices if it can be made to spread to windward.

(4) Oil spreads very slowly, so that a vessel with engines stopped or running slowly before a sea can make a slick to windward but not to leeward, except perhaps close alongside, for the vessel's drift or speed will exceed the rate of spread of the oil.

(5) The effect of oil on free waves—that is, on waves in deep water—is greatest.

(6) The effect of oil on a surf or waves breaking on a bar where a mass of shallow water is in actual motion is less than on free waves, but oil is of some service under these conditions.

(7) A vessel at sea will get the best results by drifting or running slowly before the sea, and distributing oil either from canvas bags filled with oakum saturated with oil and slung over the side into the sea or from the waste pipes.

(8) In crossing a bar in heavy weather oil in considerable quantities is needed on both sides of the vessel for a very short time. A convenient method in this situation is to trail a hose over the bow and pour oil freely through it.

(9) In crossing a bar with flood current pour oil overboard and allow the oil to float in ahead of the vessel. To an entering vessel crossing a bar with an ebb current oil is of little use.

(10) Oil is useful to vessels and boats when running, or lying to, or in wearing.

(11) A vessel riding to a sea anchor can fasten an oil bag to an endless line rove through a block on the sea anchor. This method distributes the oil ahead and provides a means to haul the bag aboard for refilling.



(12) Before boarding a wreck have the wreck use oil freely on both sides, if able to do so. If the wreck can not use oil, the rescuing vessel should first pass to leeward of the wreck, using oil freely to form a slick into which the wreck will drift.

If the wreck be aground, the attending circumstances will indicate the methods to be used.

(13) In lowering or hoisting boats in heavy weather, in port, or at sea, oil will greatly assist the operation.

(14) In towing another vessel in a heavy sea, oil should be distributed from the towing vessel forward and on both sides; if it is only distributed from the after part of the towing vessel, only the tow is benefited.

# LESSER ANTILLES AND COAST OF VENEZUELA

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## CHAPTER I

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### GENERAL REMARKS—WINDS—CYCLONIC STORMS—CURRENTS— CHANNELS—ROUTES

**GENERAL REMARKS.**—This volume describes the islands of the Lesser Antilles, those lying off the northern coast of South America, the Orinoco River, and the mainland of that continent between the Orinoco River and Gallinas Point, near the Venezuela-Colombia boundary.

**Geography.**—The Lesser Antilles are commonly divided into two groups, those islands lying northward of and including Martinique being termed “the Leeward Islands,” while those to the southward are called “the Windward Islands.”

**Sovereignty.**—The islands of Virgin Gorda, Tortola, Anegada, Sombbrero, Anguilla, St. Christopher (St. Kitts), Nevis, Montserrat, Barbuda, Antigua, Dominica, St. Lucia, St. Vincent, the Grenadines, Grenada, and Barbados are possessions of Great Britain; the northern part of St. Martin, St. Bartholomew, Martinique, and Guadeloupe (with Marie Galante and other outlying islands) are under the dominion of France; Aruba, Curaçao, Bonaire, Saba, St. Eustatius, and the southern part of St. Martin belong to Holland; St. Thomas, St. John, and St. Croix (or Santa Cruz) are possessions of the United States.

**Formation.**—The West Indies Islands are high and generally mountainous. The majority of them are of comparatively recent volcanic formation, but there is much rock of calcareous origin overlying and intermingled with the volcanic; they weather into an exceedingly fertile soil that supports vegetation to its very summits. The islands are for the most part densely wooded, with magnificent forest trees, wherever cultivation has not cleared the ground.

**Products.**—The principal productions of the Lesser Antilles are sugar, molasses, rum, coffee, tobacco, indigo, lignum-vitæ, pimento, logwood, mahogany, beeswax, and tropical fruit. The climate and soil are favorable for the growing of fiber-yielding plants; and ginger, spices, the coconut palm, together with many kinds of drug-

yielding plants, can be grown throughout the greater part of the Lesser Antilles.

The West Indies Islands are not wealthy in minerals, while Venezuela, on the contrary, is rich in gold, silver, copper, petroleum products, and iron. This latter country is also a producer of sugar, cocoa, coffee, hides, rubber, and cattle.

**Population.**—The inhabitants of the West Indies are four-fifths negroes, the remaining fifth being made up of creoles and settlers.

**SIGNALS—Storm signals.**—The United States storm signals are shown on the Pilot Charts. These signals are shown in the United States Virgin Islands.

Storm signals of the other territories of this volume are described in the text of the Sailing Directions.

**French pilot flag.**—The French pilot flag is of the same form as the flag "W" of the International Code, but with the colors interchanged, the center of the flag being blue and the outer border being red. This flag should be exclusively used to make the request for a pilot.

**Aircraft distress signals.**—When any aircraft is in distress and requires assistance the following shall be the signals displayed by her, either together or separately:

1. The International signal S O S by means of visual or radio telegraphy, or in the case of radio telephony the spoken word "Mayday."

2. The International Code signal of distress indicated by N C.

3. The distant signal consisting of a square flag having above or below it a ball or anything resembling a ball.

4. A continuous sounding with any sound apparatus.

5. A signal consisting of a succession of white Very's lights, fired at short intervals.

6. A white flare from which at intervals of about 3 seconds a white light is ejected into the air.

The above signals are subject to such modification as shall be published from time to time.

**Special signals for surveying vessels** of the United States employed in hydrographic surveying are as follows:

A surveying vessel of the United States, under way or at anchor in a fairway and employed in hydrographic surveying, may carry where they can best be seen, but in any case well above the navigational lights prescribed by law for preventing collisions, three lights in a vertical line one over the other and not less than 6 feet apart. The highest and lowest of these lights shall be green, and the middle light shall be white, and they shall be of such a character as to be

visible all around the horizon at a distance of at least 2 miles. In the case of a small vessel the distance between the lights may be reduced to 3 feet if necessary.

By day such surveying vessel may carry in a vertical line, not less than 6 feet apart, where they can best be seen, three shapes of not less than 2 feet in diameter, of which the highest and lowest shall be globular in shape and green in color, and the middle one diamond in shape and white.

The wire drags, some of which are over 2 miles long, used in sweeping for dangers to navigation, may be crossed by vessels without danger of fouling at any point except between the towing launches and the large buoys near them, where the towline approaches the surface of the water. Steamers passing over the drag are requested not to pass close to the towing launch; also to change course so as to cross the drag approximately at right angles, as a diagonal course may cause the propeller to foul the supporting buoys and attached wires.

Lighthouse tenders when working on buoys in channels or other frequented waters may display a red flag (international signal-code letter B) and a black ball at the fore as a warning to other vessels to slow down in passing.

**Radio.**—For radio weather bulletins, storm and navigational warnings, and time signals, see H. O. Publication No. 205, *Radio Aids to Navigation*.

**Searchlight inconvenience signals.**—Any vessel approaching a port owned by Great Britain or France when searchlights are being worked and finding that they interfere with her safe navigation may make use of the following signals, either singly or combined:

(a) By flashing lamp, four short flashes followed by one long flash.

(b) By whistle, siren, or foghorn, four short blasts followed by one long blast.

Whenever possible, both flashing lamp and sound signals should be used.

On these signals being made, the searchlights will be worked, as far as circumstances will permit, so as to cause the least inconvenience, being extinguished, raised, or their direction altered.

The signals should not be used without real necessity, as unless the vessel is actually in the rays of a searchlight it is difficult to determine which searchlight is affected. The signals should be repeated until the inconvenience has been removed.

**Note.**—These signals are designed to assist mariners and do not render the Government liable in any way.

**United States submarine warning flag.**—The submarine distinguishing and warning flag, consisting of a red rectangular flag with white center on which is the profile of a torpedo in black, is hoisted on the tender or parent ship of United States submarines to indicate that submarines are operating in the vicinity. Launches accompanying submarines also fly this flag. Vessels seeing this signal should give the escorting vessel a wide berth and keep a good lookout for submarines.

**Consuls.**—There are consular representatives of the United States at the following ports: Pointe-a-Pitre, Guadeloupe; Fort de France, Martinique; Bridgetown, Barbados; Roseau, Dominica; Port Castries, St. Lucia; Port of Spain, Trinidad; St. George, Grenada; Willemstad, Curaçao; La Guaira, Maracaibo, and Puerto Cabello, Venezuela.

**Fuel.**—Coal in quantities in excess of 500 tons or more is available at the following ports: St. Thomas, Virgin Islands; Fort de France, Martinique; Port Castries, St. Lucia; Bridgetown, Barbados; Port of Spain, Trinidad; and Willemstad, Curaçao.

Fuel oil in sufficient quantities to bunker vessels can be obtained at the following ports: St. Thomas, Virgin Islands; Port of Spain and San Fernando, Trinidad; Puerto Cabello, Venezuela; Willemstad and Caracas Bay, Curaçao; and St. Nicholas Bay, Aruba.

**Dry docks.**—See Appendix II.

**CLIMATE.**—All the territory lying within the scope of this publication is within the Tropics, but the heat is usually tempered by the sea breezes, and on the higher parts of most of the islands a cool temperature is obtained. The climate at the coast is generally enervating for an American or a European, but on the islands it can not be called unhealthy when compared to other tropical regions. Yellow fever occasionally becomes epidemic.

The year within the Tropics, being usually divided into a wet and a dry period, needs no further division as to seasons in covering the territory embraced by this work. During the period from the 1st of December to April the West India Islands experience their dry season, during which the weather is serene, dry, and pleasant, interrupted occasionally by winds from the north and northwest, known as "northers," blowing across the trade, at times with considerable violence. April and May are the most tranquil months in all parts of the West Indies, when fine weather and smooth seas will be experienced. Except for certain local variations it may generally be stated that the rainy season prevails from May and June to October or November, when the weather is hot and oppressive.

Along the coast of Venezuela the climate is humid, and in the lowlands malarial fevers, mild dysentery, and an occasional visitation of

yellow fever are the prevailing diseases. The temperature ranges between  $78^{\circ}$  to  $91^{\circ}$ , though upon rare occasions it rises to  $94^{\circ}$ , and, except at the ports situated in the vicinity of swamps, is not considered unhealthy in the winter or early months of the year.

La Guaira being situated at the foot of the mountains, is very hot, but is tempered by the night wind blowing regularly from the mountains to the sea, making the city less unhealthy than most ports in Venezuela. Puerto Cabello and Maracaibo are unhealthy, hot, and damp. The dry and healthiest season on the coast is from October to March; it seldom rains between January and March. Inland, on the lower plains of the Orinoco, the driest months are April and May. The rainy season is from about April to October, but it occurs later in the Gulf of Venezuela, there occurring from August to December. This is the most unhealthy season.

The temperature becomes agreeable and altogether healthful when an altitude of 2,000 to 6,000 feet (609.6 to 1,828.8 m.), the thermometer there registering between  $59^{\circ}$  and  $78^{\circ}$ . The coldest months are December and January, with a temperature around  $59^{\circ}$ . In the highland districts above 7,000 feet (2,133.6 m.) is a cold zone.

**Barometer readings.**—The graduation of barometric scales in millibars having now been largely introduced, the accompanying diagram is inserted to enable the mariner to convert millibars into inches and vice versa.



**Earthquakes.**—The West India Islands are subject to earthquake shocks, and there is scarcely one in which some memorial of disaster from this cause does not exist. Slight shocks of earthquake are very frequent, especially in the Virgin and Windward Islands. They are sometimes strong enough to do serious damage on land, the most severe shocks having occurred at Guadeloupe and St. Thomas. The large majority of the shocks are, however, slight; the heavy sea waves, which frequently rise without any apparent cause and dash heavily against the shores of the islands, may be due in some cases to them. These rollers are most frequent in the eastern part of the West Indies, but occur at times on all the islands. They frequently make landing dangerous, and have been known to tear vessels from their anchorages and cast them ashore. They have been attributed to gales of wind prevailing at a distance, to interference between or union of the ordinary waves caused by the trades, and to earthquake shocks. Navigators, by noting all the attendant circumstances when these phenomena are perceived, will assist greatly in finding out the laws that govern them.

**WINDS.**—The zone of the northeast trade wind moves northward and southward with the declination of the sun to the extent of about  $3^{\circ}$  at its northern margin (averaging about Lat.  $27^{\circ}$  N.), and about  $10^{\circ}$  at its equatorial edge; that is, the southern limit of the northeast trade ranges between Lat.  $13\frac{1}{2}^{\circ}$  N. in August and Lat.  $21\frac{1}{2}^{\circ}$  N. in February. It often reaches farther southward, but seldom crosses the Equator, while, on the contrary, the southeast trade often reaches as far north as Lat.  $10^{\circ}$  N. in August near the 30th meridian west.

The northeast trade wind prevails over the whole of the West Indies, and among the islands its course is uninterrupted, though subject to some modifications in direction and force; at a short distance from the land the sea breeze dies away at night, giving way to the land wind; this alternation occurs regularly except when broken by a strong north or south wind. During July and August the sea breeze generally blows hard and in frequent squalls. From July to October the trade wind is generally southward of east.

Squalls of more or less severity are common during the summer months throughout the West Indies. They are generally of the arched form and accompanied by thunder and lightning, occurring most frequently near the land; this, together with the fact that violent flaws of wind are frequently met with under or near high land, should be sufficient warning to the mariner to exercise caution when coasting along such points in this region. It is even said that white squalls, so called, occur at certain places where the steep hills and mountains are favorable to their formation; they give but scant warning of their approach except the ripple on the water; they are fortunately of rare occurrence.

**HURRICANES.**—The West Indies lie directly in the path of the tropical cyclonic storms of the North Atlantic, the majority of which apparently originate in the northern margin of the doldrums, or belt of equatorial calms. Thence the motion of the storm center is in a direction between west and north until the northern limit of the trades is reached, after which the motion is toward a point between north and east. Such a course will ordinarily carry the storm, after leaving the Tropics, northward along or somewhat to the eastward of the Atlantic coast of the United States. In certain instances, however, as in the case of the Galveston hurricane of September, 1900, the center continued its westerly course across the Gulf of Mexico and entered the mainland before recurving. The duration of hurricanes vary. On the morning of September 26, 1898, a hurricane of small area, but of great intensity, was discovered central to the west of Eleuthera. By the 27th it had reached the coast of Great Abaco, recurving toward the northeast. On the 28th all

traces of the storm had disappeared, nor was it again reported. At the opposite extreme stands the Porto Rican hurricane of August, 1899, the path of whose center was traced day after day from its position southwest of the Cape Verde Islands, August 3, westward to the coast of Florida, northward to the capes of the Chesapeake, and eastward to the center of the Mediterranean Sea, the whole course occupying 37 days.

**General remarks on causes of winds.**—Winds are produced by differences in atmospheric pressure in adjacent localities. These pressure differences are due principally to differences in temperature.

In general, air, like water or any other fluid, if unrestrained, will flow from a region of higher pressure toward one of lower pressure. It is this property, modified by the rotation of the earth and various local influences, which causes the periodical winds of the world and also the great cyclonic storms, both tropical and extratropical.

The earth is surrounded by an envelope or sea of air, the bulk of which lies within 10 miles of the earth's surface, though excessively rarified air probably occurs at a height of 300 miles or more. This sea of air partakes of the movements of the earth and is also influenced so as to cause atmospheric tides somewhat similar to the tides which occur in the oceans, but of an entirely different origin.

The occurrence of these tides is shown in the double diurnal movement of the barometer. This movement is very marked and regular in the Tropics, but less so in higher latitudes.

There are two periods of high barometer each day, one occurring about 10 a. m., the other at 10 p. m., and two corresponding periods of low barometer at 4 a. m. and 4 p. m.

From 4 to 10, morning and evening, the barometer is rising; from 10 to 4, day and night, it falls.

The range of the double diurnal oscillation is greatest at the Equator, where it amounts to 0.10 inch.

In the Tropics a marked variation of the barometer in connection with the double diurnal oscillation indicates a change of weather. In higher latitudes, where the double diurnal movement is not so marked and other influences predominate, the barometer is not so sure a guide. In middle latitudes the double diurnal movement is more marked in summer than in winter.

In addition to the double diurnal oscillation, the barometer has other regular variations, but as these extend over long periods of time they are of theoretical interest rather than practical value to the mariner.

**Normal distribution of pressure.**—The study of a large number of barometric observations under normal conditions shows that the earth is partly girdled in each hemisphere by a belt or ridge of higher atmospheric pressure. In the Northern Hemisphere this



ridge lies approximately along lat.  $35^{\circ}$  N. In the Southern Hemisphere it is about lat.  $30^{\circ}$  S.

From the summit of each of these ridges the pressure falls off both toward the Equator and the adjacent pole, although much less rapidly in the former direction than in the latter.

The pressures are also somewhat unequally distributed in the two hemispheres, owing largely to the differences in amount and distribution of land.

As the result of the above distribution of pressure there is in each hemisphere a continual motion of the surface air away from the ridge of high pressure toward the Equator on one side and toward the pole on the other, the first constituting in each case a portion of the trade winds and the second part of the prevailing winds of middle latitudes.

Upon a stationary earth the direction of this motion would be immediately from the region of high toward the region of low barometric pressure.

Where the change from high to low pressure occurred quickly the wind would blow with the force of a gale; where the change was gradual only gentle breezes would result.

The earth, however, is in rapid rotation, and this rotation exercises a material influence over the winds which, as explained, are caused by the differences in pressure.

Points on the surface of the earth near the poles have a less rapid linear or circumferential velocity than points situated nearer the Equator. Air, therefore, which leaves a position in a higher latitude having the velocity of the earth at that point and flows toward the Equator where the earth's surface has a greater linear velocity, is apparently left behind by the more rapidly moving earth as it turns from the west to east and the wind draws accordingly more and more from east to the west, forming the northeast trades in north latitude and the southeast trades in south latitude. Similarly, the air which starts from the region of high pressure in middle latitudes or overflows from equatorial regions and moves toward the poles is starting with the linear velocity of the earth from west to east in those latitudes and moving toward a region where the velocity of the earth's surface is continually growing less, thus making the wind blow more and more from the westward in each hemisphere. As a matter of fact, the effect of change of latitude is much greater than the difference in surface linear velocity, owing to the principle known in astronomy as the conservation of areas.

Thus the general circulation of the winds on the surface of the earth is from east to west in the Tropics, both north and south of the Equator, and from west to east in middle and high latitudes.

This general circulation may be and frequently is interfered with by local conditions, particularly in the Northern Hemisphere.

If at any point in the above-described system of air circulation there occurs a local area of low pressure, the air from the surrounding region of high pressure is forced inward, not toward the center, however, but spirally around it, the velocity of the lower air depending upon the rapidity of the change from high to low pressure.

**Cyclones.**—This inward flow is converted by the rotation of the earth in the manner explained above into an atmospheric whirl turning to the left, or counterclockwise, in the Northern Hemisphere and in the opposite direction in the Southern Hemisphere. The name cyclone has been given to this system of winds. It is also frequently called a “low” or “depression.”

The term “cyclone” was first applied to storms about the middle of the nineteenth century, after they were found to be circular in form. Up to this time strong winds were known variously as storms, meteors, tempests, or merely as great winds, except in the case of the violent tropical storms of the East and West Indies, where early voyagers heard them called, respectively, typhoons and hurricanes. These words came into more or less common usage several centuries before the term “cyclone” was applied to revolving storms.

**Classification of cyclones.**—Cyclones are variously classified, according to duration, as semipermanent and migratory, or traveling; to season of occurrence, as winter and summer; to zone of origin, as tropical and extratropical. There are seven semipermanent cyclones in different parts of the world, the most prominent of which are, in the Northern Hemisphere, the so-called Icelandic and Aleutian lows, and in the Southern Hemisphere those of Ross Sea and Weddell Sea. The Aleutian low is active during winter only.

The semipermanent cyclones are due to temperature differences between the surfaces of the regions they occupy and the regions that partly surround them. The winds caused by these temperature differences are converted into cyclonic systems by the deflective force of the earth's rotation.

Many of the migratory or traveling cyclones move directly into the regions occupied by the semipermanent ones and merge with them. On the other hand, there are numerous offshoots from the latter that become traveling cyclones. Not infrequently a migratory cyclone will develop at some point on its border a more or less perfectly formed low, known as a “secondary.”

Cyclonic systems are often referred to as “depressions” and sometimes as “disturbances.”

The two general types of migratory cyclonic storms, known as tropical and extratropical, though chiefly distinguished from one another by the zone of origin, also differ from one another in size,

intensity, direction of movement, and the way in which they are maintained or dissipated. Storms of the latter class—that is, extratropical—are by far the more numerous, being of daily occurrence in middle and northern latitudes. Their number as well as intensity is greater, however, in the colder seasons of the year. Their place of origin is not restricted, and they may and do form over the continents, though in much larger numbers over the oceans. Generally, but not always, they increase in intensity on passing from the continents to the oceans and diminish in energy on passing from the oceans to the continents.

Tropical cyclones, on the other hand, are of comparatively rare occurrence. They form only over certain well-defined and limited water areas of the Tropics and quickly lose energy on reaching a large land surface. They also lose energy, though more slowly, as they progress toward middle latitudes over the oceans, usually at the same time expanding in size. On nearing or reaching the highest latitudes of the ocean a cyclone of tropical origin either dissipates or takes on the characteristics of an extratropical storm.

Tropical cyclones, such as visit the North Atlantic, North and South Pacific, and Indian Oceans, originate in the more or less definite region known as the doldrums, that narrow belt lying between the northeast and southeast trade winds. It is a region characterized by sultry air and calms or light and baffling breezes, interrupted by frequent rains, thunderstorms, and squalls.

The South Atlantic Ocean is free from cyclones of tropical origin, the reason being that the Atlantic doldrums are almost entirely north of the Equator, their southernmost position, which occurs in March, being commonly between lat.  $3^{\circ}$  N. and the Equator. They rarely reach south of that latitude and, if so, only for a brief period.

The origin of tropical cyclones is obscure in some of the details, but the absence of such storms from the continental regions of the Tropics and their early disintegration after passing from the sea to the land go to show that their maintenance is dependent on a supply of water vapor, which in the doldrums is present in the atmosphere in large amounts. The vapor-laden and heated air of these regions is underrun and forced upward by adjacent denser air—denser because drier and cooler. Thus, perhaps, is begun that process which later results in a continuing system of winds blowing around a moving center and constituting a tropical cyclone.

The newly born storm drifts slowly westward with the current of free air and with this current later deviates poleward and crosses the trade-wind belt, usually on the western side of the ocean in which it has its origin. Here the trades have begun to break into irregularity, owing to the influence of the islands and continents, and this irregularity is reflected in the tracks of these storms, the centers

of which commonly follow the free air currents of the general circulation.

Fully developed, the tropical cyclone consists of a well-defined area, more or less circular in shape, throughout which the atmospheric pressure diminishes rapidly on all sides toward the center or point of lowest barometer, the rate of this diminution amounting in the case of severe storms to 0.01 or even 0.02 inch for each mile of approach. Within this area, on the sides, as it were, of the barometric depression, the winds blow with great force, the velocity of the moving air increasing with the steepness of the barometric slope or gradient, the direction, however, as previously explained, being not toward but around the center, the motion of the air suggesting very forcibly, on a gigantic scale, the familiar path followed by water in escaping from a circular basin by a central opening in the bottom. At the center itself—the point of lowest pressure—is a region seldom more than 10 or 20 miles in diameter throughout which calm or light air prevails. Here, too, the dense canopy of cloud which overhangs the storm area is pierced, forming the so-called “eye of the storm.” The seas within the area are, however, violent and confused, sweeping in from all sides with overwhelming violence.

Extratropical cyclones are larger than those which originate in the Tropics and may have a diameter as great as 1,500 or 2,000 miles, although the average size is probably between 500 and 1,000. Almost without exception they move in an easterly direction which, however, may have a large north or south, usually north, component. Over the oceans and the central and eastern portions of the continents the temperature of the air in front of the extratropical cyclone is relatively warm while in the rear it is cold. Over the western portions of the continents, especially in winter, this temperature distribution is in general reversed.

The outstanding features of the tropical cyclone are the violent winds; the calm center or vortex, called the “eye” or “bull’s-eye”; the driving, blinding deluge of rain; and the terrifying noise. Although winds of hurricane force are not infrequent in storms of middle latitudes, there is an indescribable fury in the fully developed storms of the Tropics.

The size of tropical cyclones varies greatly. In the case of West Indian hurricanes, considering the area in which winds of gale force prevail, the average diameter is some 300 miles. The diameter of the area of destructive winds is, however, much smaller. The size of the vortex, or calm area, likewise varies. It rarely exceeds 15 to 20 miles in diameter and may be as little as 7 miles.

The usual track of the tropical cyclones resembles a parabola, of which the first branch has its extremity in the region of the doldrums, as already explained, and the second branch, running to the east and north, has its extremity in middle latitudes. Here it either dissipates or takes on the form of an extratropical cyclone.

For various reasons, not all of which perhaps are fully understood, the track of the tropical cyclone does not always follow the parabolic form. The principal cause of divergence is the presence of anti-cyclonic systems, which block the progress of the cyclone and either temporarily or permanently force it from a normal course. In the former case the effect is merely to cause irregularities, or points of inflection, in the track, while in the latter case a complete divergence from type frequently results. In a few cases of record the effect of a temporary blocking has been to cause the center of the cyclone to describe a small loop in its track.

Figure 1 illustrates the typical parabolic track of a tropical cyclone of the Northern Hemisphere with its attendant system of winds blowing counterclockwise and directed somewhat toward the center. The amount of "indraft" seems to vary in the different quadrants. In several West Indian hurricanes that have been studied the "indraft" was found to be greatest in the right-hand rear quadrant and least in the left-hand front quadrant. The statement is frequently met with that in cyclones of the South Indian Ocean the northeasterly and easterly winds (understood to mean before the storm recurves) seldom, if ever, blow around the center, but almost directly toward it. These winds correspond in part to those of the right-hand rear quadrant of cyclones of the Northern Hemisphere, in which quadrant, as just stated, the inclination toward the center was also found to be greatest in the case of certain West Indian hurricanes.

It will be noted from Figure 1 that in portions of both right-hand quadrants the winds blow in the general direction of the line of advance of the storm. It is these violent, sustained winds, sometimes blowing in one direction for several days, that causes the storm waves, or swell, so destructive on the coasts visited by tropical storms. Careful observations made by use of the tide gauges on the coast of the Gulf of Mexico show, that the highest storm tide occurs in front of tropical storms and immediately to the right of the line of advance of the center.

**Period and frequency of tropical cyclones.**—With the exception of the North Pacific Ocean, the Arabian Sea, and Bay of Bengal the occurrence of tropical cyclones is confined to the summer and autumn months of the respective hemispheres and, for the most part, to the western portions of the several oceans. In the South Atlantic they are unknown, for reasons already explained. In the

North Pacific they occur in all months, but are most frequent in July, August, September, and October. The months of greatest frequency in the Arabian Sea and Bay of Bengal are May and October. Small but nevertheless violent cyclones occur in the eastern part of the North Pacific Ocean, off the coast of Mexico and Central

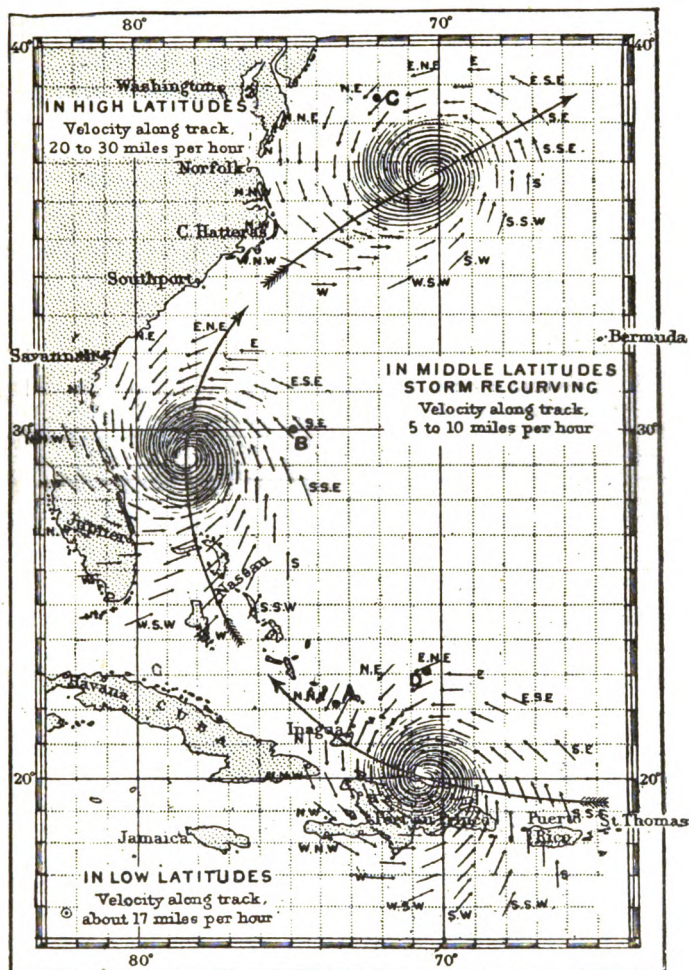


FIG. 1.—Characteristic track and wind system of tropical cyclone of Northern Hemisphere

America, and have likewise been experienced in the eastern part of the South Indian Ocean, near Australia.

In the North Atlantic Ocean, including the Caribbean Sea and Gulf of Mexico, the months of greatest frequency are August, September, and October, the time of maximum frequency occurring during the first half of September. The number actually occurring here is probably slightly greater than the number recorded. Owing

to the small size of some of these storms, especially while within the Tropics, where the diameter of the area of violent winds is frequently less than 100 miles, and also to the scarcity of observing vessels in portions of the regions they traverse, it is probable that a small percentage escapes observation. The following table shows the number of tropical cyclones which have occurred in the West Indies in the 39-year period, 1887-1925, according to the records of the United States Weather Bureau. The tracks of those hurricanes which occurred during the first half of September will be found depicted in Figure 2.

*Occurrence of West Indian Hurricanes, 1887-1925*

	1887- 1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	Total
May.....	1	0	0	0	0	0	0	0	0	0	0	1
June.....	13	1	0	0	0	0	1	1	0	1	0	17
July.....	14	2	0	0	1	0	0	0	0	0	0	17
August.....	32	3	1	2	0	0	0	0	1	2	1	42
September.....	60	3	1	2	2	4	3	2	1	2	1	81
October.....	62	3	0	0	0	0	1	2	3	1	0	72
November.....	13	1	0	0	1	0	0	0	0	1	1	17
December.....	2	0	0	0	0	0	0	0	0	0	0	2
Total.....	197	13	2	4	4	4	5	5	5	7	3	249

**Information regarding tropical cyclones by radio.**—The almost universal use of radio at sea has largely rendered unnecessary the need for determining from a single set of observations whether a storm exists that is likely to affect a vessel, and if so, to locate its center and direction of travel. This is particularly true of the coastal waters of the North Atlantic and North Pacific Oceans and the regions frequented by tropical cyclones. Through the agency of various meteorological services the centers of nearly all storms or depressions are promptly located and information respecting their intensity and probable future movement broadcast at short intervals.

It is desirable, however, for the benefit of those who for any reason may not be in position to receive such information, that the rules for establishing the existence of a storm and locating its center be explained.

**Rules for establishing the existence of a storm and locating its center.**—During the season of tropical storms any interruption in the regularity of the diurnal oscillation of the barometer should be considered an indication of a change of weather. The barometer is by no means an infallible guide for warnings much in advance, but after the beginning of a storm it will more or less accurately indicate the rapidity of approach and distance from the center and its indications should in no case be disregarded.



One of the earliest indications of the approach of a tropical storm is the appearance of the sky and general clearness of the atmosphere. These storms are almost invariably preceded by a day of unusual clearness, when distant objects not ordinarily visible stand out with

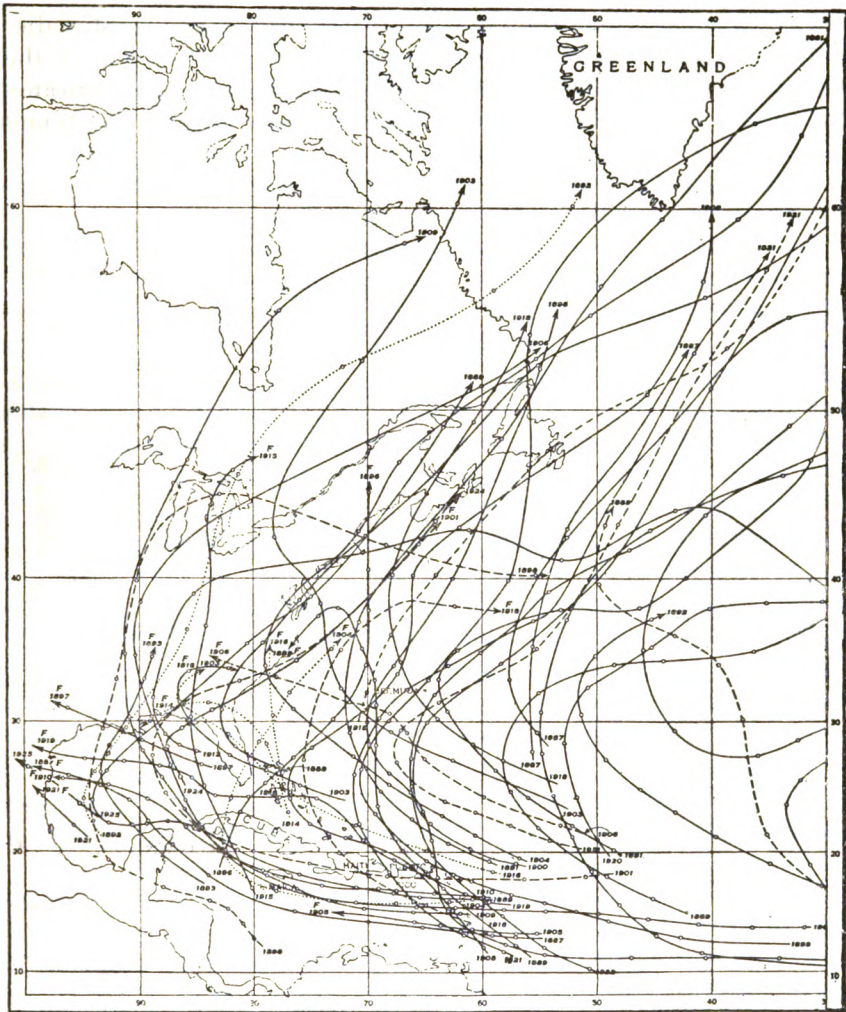


FIG. 2.—Tracks of tropical cyclones of North Atlantic, September 1–15, 1887 to 1924

great distinctness. The atmosphere at such times is more than usually oppressive.

These conditions are frequently accompanied by an unusually high barometer. Later it may be followed by a restless oscillating or pumping of the mercury caused by the disturbed condition of the atmosphere. Then the sky becomes overcast and remains so, at first with a delicate cirrus haze, which shows no disposition to clear away



at sunset, but which later becomes gradually more and more dense until the dark mass of the true hurricane cloud appears upon the horizon. From the main body of this cloud portions are detached from time to time and drift across the sky, their progress marked by squalls of rain and wind of increasing force. Rain, indeed, forms one of the most prominent features of the storm. In the outer portions it is fine and mistlike, with occasional showers, these later increasing in frequency and in copiousness. In the neighborhood of the center it falls in torrents. The rain area extends farther in advance of the storm than in the rear.

A long swell from the direction of the storm frequently sets in before any other indication becomes marked.

When the sky first becomes overcast with the characteristic veil of cirrus the storm center will most probably lie in the direction of the greatest density of the cloud.

When the hurricane cloud appears over the horizon it will be densest at the storm center.

By this time the barometer will usually be showing unmistakable evidence of a fall, and one may confidently look for a storm and begin observations to determine the location of its center and the direction in which it is moving.

Surrounding the actual storm area is a territory of large extent throughout which the barometer reads 0.10 inch or more below the average, the pressure diminishing toward the central area, but with no such rapidity as is noted within that area itself. Throughout the outer ring unsettled weather prevails. The sky is ordinarily covered with a light haze, which increases in density as the center of the storm approaches. Showers are frequent. Throughout the northern semicircle of this area (in the Northern Hemisphere) the wind rises to force 6 or 8—the “reinforced trades”—and is accompanied by squalls; throughout the other semicircle unsettled winds, generally from a southeasterly direction, prevail.

It is very important to determine as early as possible the location and direction of travel of the center.

While this can not be done with absolute accuracy with one set of observations, a sufficiently close approximation can be arrived at to enable the vessel to maneuver to the best advantage.

Another means of detecting the approach of a storm may be found in the study of the correlation of static with the atmosphere.

From the results of experimental work with a static recording machine, conducted on board the U. S. S. *Kittery* from 1924 to 1926, it is believed that a relation between storm centers and static centers exists—i. e., that active highs are relatively static free, and the center of intense lows is attended by proportionately heavy static.

To investigate this theory further, a new type of machine for recording static intensity and direction is being developed and it is planned to have a spread of these recorders covering several points in the West Indies and the Atlantic Coast of the United States. By means of cross bearings on the static centers received from the various recorders it may be possible to detect the approach of a storm before the barometer would give any indication of it, and later fix the location and direction of travel of the center.

**Handling the ship within the storm area.**—If from the weather indications given above and such others as his experience has taught him the navigator is led to believe in the approach of a storm, he should at once—

First. Determine the bearing of the center.

Second. Estimate its distance.

Third. Plot its apparent path.

The first two of the above determinations will locate the approximate position of the center, which should be marked on the chart. The relation between the position of the ship and the position and prospective track of the center will indicate the proper course to pursue (*a*) to enable the vessel to keep out of or escape from the dangerous semicircle and to avoid the center of the storm; (*b*) to enable the vessel to ride out the storm in safety if unable to escape from it.

Should the ship be to the westward of the storm center it may be assumed that the latter will draw nearer more or less directly. It then becomes of the utmost importance to determine its path and so learn whether the vessel is in the right or left semicircle of the storm area.

The right and left semicircles lie on the right and left hands, respectively, of an observer standing on the storm track and facing in the direction the center is moving. Prior to recurving, the winds in that semicircle of the storm which is more remote from the Equator (the right-hand semicircle in the Northern Hemisphere, the left-hand semicircle in the Southern) are liable to be more severe than those of the opposite semicircle. A vessel hove-to in the semicircle adjacent to the Equator has also the advantage of immunity from becoming involved in the actual center itself, inasmuch, as there is a distinct tendency of the storm to move away from the Equator and to recurve. For these reasons the more remote semicircle (the right hand in the Northern Hemisphere, the left hand in the Southern Hemisphere) has been called the dangerous, while that semicircle adjacent to the Equator (the left hand in the Northern Hemisphere, the right hand in the Southern Hemisphere) is called the navigable.

In order to determine the path of the storm, and consequently in which semicircle the ship finds herself, it is necessary to wait until

the wind shifts. When this occurs, plot a new position of the center 10 points to the right of the new direction of wind as before, and the line joining these two positions will be the probable path of the storm. If the ship has not been stationary during the time between the two sets of observations (as will indeed never be the case unless at anchor), allowance must be made for the course and distance she has traveled in the interim.

Two bearings of the center with an interval between of from two to three hours will, in general, be sufficient to determine the course of the storm, provided an accurate account is kept of the ship's way, but if the storm be moving slowly a longer interval will be necessary.

Should the wind not shift, but continue to blow steadily with increasing force, and with a falling barometer, it may be assumed that the vessel is on or near the storm track. Owing to the slow advance of storms in the Tropics, a vessel might come within the disturbed area though overtaking the center. In such a case a slight decrease in speed would probably be all that would be necessary, but it should be borne in mind that the storm path is by no means constant either in speed or direction, and that it is particularly liable to recurve away from the Equator.

A vessel hove-to in advance of a tropical cyclonic storm will experience a long heavy swell, a falling barometer with torrents of rain, and winds of steadily increasing force. The shifts of wind will depend upon the position of the vessel with respect to the track followed by the storm center. Immediately upon the track the wind will hold steady in direction until the passage of the central calm, the "eye of the storm," after which the gale will renew itself, but from a direction opposite to that which it previously had. To the right of the track, or in the right-hand semicircle of the storm (the observer being supposed to face along the track), the wind, as the center advances and passes the vessel, will constantly shift to the right, the rate at which the successive shifts follow each other increasing with the proximity to the center; in this semicircle, then, in order that the wind shall draw aft with each shift, and the vessel not be taken aback, a sailing vessel must be hove-to on the starboard tack; similarly, in the left-hand semicircle, the wind will constantly shift to the left, and here a sailing vessel must be hove-to on the port tack so as not to be taken aback. These rules hold alike for both hemispheres and for cyclonic storms in all latitudes.

Since the wind circulates counterclockwise in the Northern Hemisphere, the rule in that hemisphere is to face the wind and the storm center will be on the right hand. In the Southern Hemisphere, under the same circumstances, the center is to the left. If the wind traveled in exact circles, the center would be 8 points to the right when looking directly in the wind's eye. We have seen, how-

ever, that the wind follows more or less a spiral path inward, which brings the center from 8 to 12 points to the right of the direction of the wind.

The number of points to the right may vary during the same storm, and as the wind usually shifts during squalls, its direction should be taken just after a squall.

The center will bear more nearly 8 points from the direction of the lower clouds than from that of the surface wind.

Ten points to the right (left in south latitude) when facing the wind is a good average allowance to make if in front of the storm, but a larger allowance should be made when in the rear. If very near the center, the allowance should be reduced to 8 or 9 points in the front quadrants.

The approximate direction of the storm center is a comparatively easy matter to determine. The direction in which it is moving may be estimated with a fair degree of accuracy from the charted paths of similar storms which have been observed before. (See fig. 2, p. 31.)

The distance away from the storm center can only be estimated very imperfectly. The following old table from Piddington's Horn Book may serve as a slight guide to this end, but too much reliance can not be placed upon it:

Average fall of barometer per hour	Distance in miles from center
From 0.02 to 0.06 inch.....	From 250 to 150.
From 0.06 to 0.08 inch.....	From 150 to 100.
From 0.08 to 0.12 inch.....	From 100 to 80.
From 0.12 to 0.15 inch.....	From 80 to 50.

This table assumes that the vessel is hove-to in front of the storm and that the latter is advancing directly toward it.

With storms of varying areas and different intensities the lines of equal barometric pressure (isobars) must lie much closer together in some cases than in others, so that it is quite impossible to more than guess at the distance of the center by the height of the mercury or its rate of fall.

At the same time storms travel at varying rates of progression. In the Tropics this ranges from 5 to 20 miles per hour, generally decreasing as the storm track turns northward and recurves, increasing again as it reaches the North Atlantic, where it may amount to as much as 50 miles per hour. Within the Tropics the storm area is usually small, the region of violent winds seldom extending more than 150 miles from the center. The barometer, however, falls rapidly as one progresses from the circumference toward the center, a difference of 2 inches having been observed in this distance.

The winds accordingly blow with greater violence and are more symmetrically disposed around the center than is the case in higher latitudes. After the storm has recurved it gradually widens out and becomes less severe, and its velocity of translation increases as its rotational energy grows more moderate. Its center is no longer a well-defined area of small size marked by a patch of clear sky and near which the winds blow with the greatest violence. Out of the Tropics the strongest winds are often found at some distance from the center.

The central area of calm and blue sky, characteristic of tropical cyclones, is not found in well-developed storms of extratropical origin. Sometimes there is found near the center of areas of low barometer where the cyclonic circulations is but imperfectly developed a region of relative calm and clear sky lying between the easterly winds on the front of the depression and the westerly winds in the rear. The phenomenon is not, however, analagous to the "eye" of the tropical cyclone. The latter appears to be due to intensity of rotation and disappears when this has sufficiently diminished. Occasionally a cyclone which originated in the Tropics will maintain its organization, including the calm center, until it reaches middle latitudes.

It must not be forgotten that the shifts of wind will only occur in the above order when the vessel is stationary. When the course and speed are such as to maintain a constant relative bearing between the ship and storm center, there will be no shift of wind. Should the vessel be outrunning the storm, the wind will indeed shift in the opposite direction to that given, and a navigator in the right semi-circle, for instance, and judging only by the shifts of wind without taking into account his own run, might imagine himself on the opposite side. In such a case the barometer must be the guide. If it falls, one is approaching the center; if it rises, one is receding.

An examination of Figure 3 shows how this is. A vessel hove-to at the position marked *b*, and being passed by the storm center, will occupy successive positions in regard to the center from *b* to *b4*, and will experience shifts of wind, as shown by the arrows, from east through south to southwest. On the other hand, if the storm center be stationary or moving slowly and a vessel be overtaking it along the line from *b4* to *b*, the wind will back from southwest to east, and is likely to convey an entirely wrong impression as to the location and movement of the center.

Hence it is recommended that a vessel suspecting the approach or proximity of a cyclone storm should stop (if a sailing ship heave-to on the starboard tack) for a while until the path of the center is located by observing the shifts of the wind and the behavior of the barometer.

If the wind remains steady in direction and increases in force in heavy squalls while the barometer falls rapidly, say, at a greater rate than 0.03 inch per hour, the vessel is probably on or near the track of the storm and in advance of the center.

In this position, with plenty of sea room, the proper course is to run with the wind well on the starboard quarter, if north of the Equator, and on the port quarter if south. The vessel will thus be in the navigable semicircle and be constantly increasing her distance from the center. The wind will draw more forward as she recedes from the center, but the compass course first set should be adhered to until well clear.

The procedure is the same if the observations place the ship anywhere within the navigable semicircle.

The most critical situation is that of a vessel finding herself in the forward quadrant of the dangerous semicircle, particularly if at some distance from the center, where the wind shifts but slowly and the barometer indications are undecided, both causes combining to render the bearing of the center uncertain.

The general object, however, of putting as much distance as possible between oneself and the storm center should be kept in view.

With steamers this may not be difficult, although, should the storm be recurving, the course first set may have to be subsequently altered in order to continue to draw away.

A sailing vessel will be set by the wind directly toward the path of the storm and may become involved with the center without being able to avoid it. If so caught in the dangerous semicircle, a sailing vessel should haul by the wind on the starboard tack when in north latitude (on the port tack in south latitude), keep coming up as the wind draws aft, and carry sail as long as the weather permits. If obliged to heave-to, do so on the starboard tack in north latitude and on the port tack in south latitude.

This maneuver, while it may not carry a vessel clear of the storm track, will make the best of a bad situation.

A vessel so hove-to will find the shifts of wind drawing aft, enabling her to come up to them instead of being headed off, as would be the case on the other tack.

Moreover, since the sea changes its direction less rapidly than the wind, the vessel will come up more nearly head-on to the old sea, instead of having it more abeam as on the opposite tack.

A general rule for sailing vessels is always heave-to on whichever tack permits the shifts of wind to draw aft.

Figure 3, representing a cyclonic storm in the Northern Hemisphere after recurving, illustrates graphically these rules for sailing vessels.

For simplicity the area of low barometer is made perfectly circular and the center is assumed to be 10 points to the right of the direction of the wind at all points within the disturbed area. Let us assume that the center is advancing about north-northeast, in the direction of the long arrow, shown in heavy full line. The ship *a* has the wind at east-northeast; she is to the left of the track, or technically in the navigable semicircle. The ship *b* has the wind at east-southeast and is in the dangerous semicircle. As the storm advances these ships, if lying-to, *a* upon the port tack, *b* upon the starboard tack, as shown, take with regard to the storm center the successive positions of  $a_1, a_2$ , etc.,  $b_1, b_2$ , etc., the wind of ship *a* shifting to the left, of ship *b* to the right, or in both cases drawing aft, and thus diminishing the probability of either ship being struck aback, with possible serious damage to spars and rigging, a danger to which a vessel lying-to on the opposite tack (i. e., the starboard tack in the left-hand semicircle or the port tack in the right-hand semicircle) is constantly exposed, the wind in the latter case tending constantly to draw forward. The ship *b* is continually beaten by wind and sea toward the storm track. The ship *a* is drifted away from the track, and should she be able to carry sail would soon find better weather by running off to the westward.

Should steamers find it necessary to heave-to, the method of doing so must depend upon the position within the storm area.

A steamer is concerned more with the damage resulting from heavy seas than from wind; furthermore, a steamer is not dependent for her course upon the direction of the wind, but is free to maneuver to keep away from the storm center, where the heaviest and most confused seas are found, unless other circumstances, such as proximity to the land, prevent.

If unable to escape from the storm, and this can be done only in low latitudes where the storm covers a comparatively limited area, the principal object of a steamer is to avoid the center of the storm.

Referring to Figure 3, it is obvious that in the Northern Hemisphere if a steamer finding herself in the left-hand (navigable) semicircle at *a* or  $a_1$  should obey the rule for sailing vessels and heave-to on the port tack, her head will lie toward the storm track and the greatest danger. On the other hand, under the same circumstances, if the steamer heaves-to on the starboard tack, her head will lie away from the storm track, and such headway as is made over the ground will all be in the direction of safety.

Following the same reasoning, a steamer in the Northern Hemisphere caught in the right-hand (dangerous) semicircle at *b*,  $b_1$  (fig. 3) and obliged to heave-to should do so head to sea, because in this case both the wind and sea are constantly beating her toward

the storm track, and when lying-to, head to sea, less leeway will be made than in any other position.

Many steamers behave better when hove-to with the sea astern or on the quarter, but the adoption of this method must depend upon the position of the vessel within the storm area. Referring again to Figure 3, it will be clearly seen that in the Northern Hemisphere

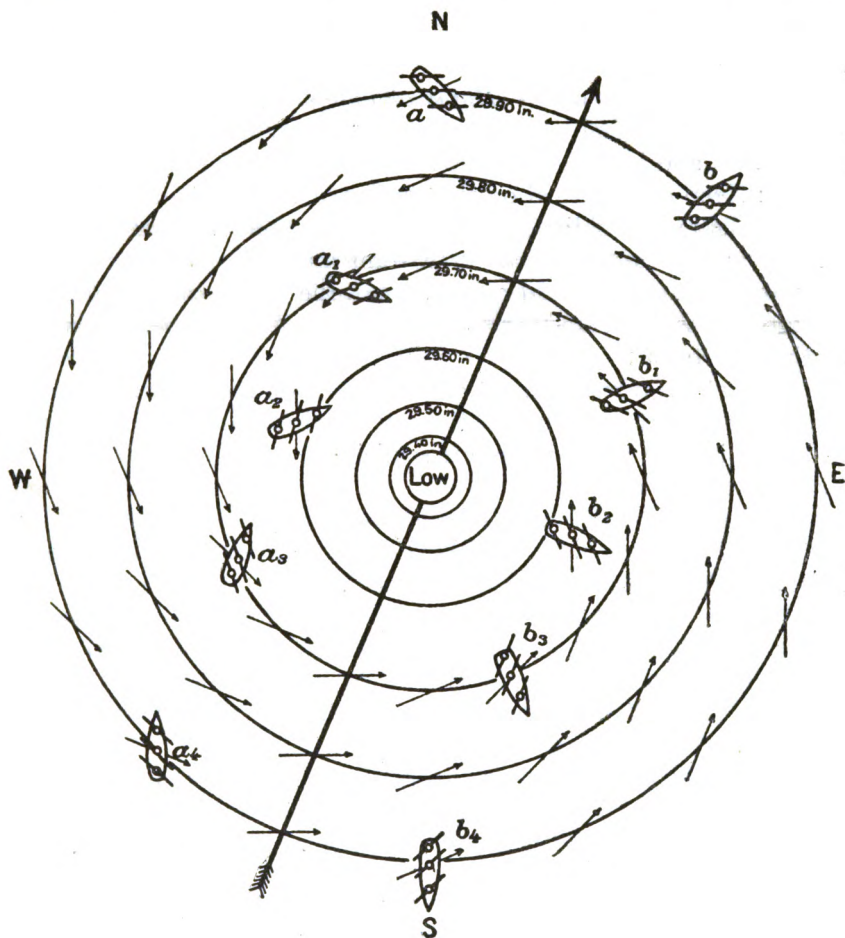


FIG. 3

if in the forward quadrant of the left-hand semicircle at positions *a*, *a*<sub>1</sub> a steamer may safely hove-to with the sea astern or on the starboard quarter. This course, however, should never be attempted when in the forward quadrant of the right-hand semicircle (positions *b*, *b*<sub>1</sub> for the reason that any headway made over the ground would be in all probability toward the storm center where the high and confused seas would be likely to inflict damage.



If in spite of all endeavors the storm center should pass directly over a vessel, she will experience a short period of calm, but the seas will be high, confused, and dangerous, being swept in from all directions. After a short interval the wind will burst with hurricane force from a point directly opposite to that from which it was blowing before, and the vessel must be prepared to meet it and to avoid being caught aback.

**Rules for maneuvering.**—The rules for maneuvering, so far as they may be generalized, are:

**NORTHERN HEMISPHERE.**—*Right or dangerous semicircle.*—Steamers: Bring the wind on the starboard bow, make as much way as possible, and if obliged to heave-to, to do so head to sea. Sailing vessels: Keep close-hauled on the starboard tack, make as much way as possible, and if obliged to heave-to, do so on the starboard tack.

*Left or navigable semicircle.*—Steam and sailing vessels: Bring the wind on the starboard quarter, note the course and hold it. If obliged to heave-to, steamers may do so stern to sea; sailing vessels on the port tack.

*On the storm track in front of center.*—Steam and sailing vessels: Bring the wind two points on the starboard quarter, note the course and hold it, and run for the left semicircle, and when in that semicircle maneuver as above.

*On the storm track in rear of center.*—Avoid the center by the best practical route, having due regard to the tendency of cyclones to recurve to the northward and eastward.

**SOUTHERN HEMISPHERE.**—*Left or dangerous semicircle.*—Steamers: Bring the wind on the port bow, make as much way as possible, and if obliged to heave-to do so head to sea. Sailing vessels: Keep close-hauled on the port tack, make as much way as possible, and if obliged to heave-to do so on the port tack.

*Right or navigable semicircle.*—Steam and sailing vessels: Bring the wind on the port quarter, note the course and hold it. If obliged to heave-to, steamers may do so stern to sea; sailing vessels on the starboard tack.

*On the storm track, in front of center.*—Steam and sailing vessels: Bring the wind two points on the port quarter, note the course and hold it, and run for the right semicircle, and when in that semicircle maneuver as above.

*On the storm track, in rear of center.*—Avoid the center by the best practicable route, having due regard to the tendency of cyclones to recurve to the southward and eastward.

The above rules depend, of course, upon having sea room. In case land interferes, a vessel should heave-to, as recommended for the semicircle in which she finds herself.

**CURRENTS.**—The equatorial current runs to the westward between the Windward Islands. It varies much in velocity, but is strongest between Trinidad and Grenada, where it has an average velocity of about  $1\frac{1}{2}$  to 2 knots, sometimes accelerated to 3 knots. Between the other islands its strength is generally less, but it is swiftest toward the shores of the different islands, though here affected by the diurnal tides. South of Barbados it is frequently very weak. Under the lee of each island there is generally slack water, of much service to vessels working to windward.

Across the northern portion of the Caribbean Sea the westerly current varies from  $\frac{1}{2}$  to 1 knot, until the meridian of Jamaica is reached, where it increases and attains as much as 3 knots as it passes between Cuba and Yucatan into the Gulf of Mexico. These currents are, however, greatly influenced by the direction and strength of the trade winds; the prevailing set is between northwest and west, but at the full and change of the moon and about the autumnal equinox an easterly (weather) current is occasionally found on the south coast of Cuba, north and south coasts of Jamaica, and south coasts of the islands of Haiti and Porto Rico. In Mona and Windward Passages the general set of the currents in the middle is to the southwestward. It is, however, variable and much disturbed near the shore by the strong and irregular tides. North of the Greater Antilles and among the Bahamas a westerly and north-westerly set is felt, which is much disturbed in the labyrinth of the Bahamas by local causes, but the average general set may be considered to be in the direction stated and about  $\frac{1}{2}$  knot. This requires close watching by the navigator.

The body of the drift current northward of Cuba, Haiti, and Porto Rico, meeting an opposition at the Bahamas, collects and forms a stream which is turned to the south and east along the northern side of that chain of islands. Along the southern coast of island of Haiti, between Aux Cayes and Cape False, the current near the land runs to the eastward and often sufficiently strong to assist a vessel to windward; but southward of Beata Point it runs strongly to the westward. In the Caribbean Sea the currents are, as a rule, greatly influenced by the direction and strength of the trade winds; the prevailing set is between northwest and west, but at the full and change of the moon and about the autumnal equinox an easterly (weather) current is occasionally found on the south coast of Cuba, north and south coasts of Jamaica, south coasts of island of Haiti and Porto Rico, and on the north shore of South America as far east as Trinidad.

**Sea temperature.**—The average temperature of the surface of the sea among the West Indies and in the Caribbean Sea is in the

month of February 76° to 80° F.; in May it is from 79° to 83° F.; in August from 82° to 84° F.; and in November from 79° to 82° F.

**Great sea waves.**—The great sea waves which sometimes rise without any apparent cause and dash heavily against the shores of islands may be due in some cases to earthquakes. These rollers are most frequent in the eastern part of the West Indies, but occur at times on all the islands. They make landing dangerous and have been known to tear vessels from their anchorages and cast them ashore. They have been attributed to gales of wind prevailing at a distance, to interference between, or union of, the ordinary waves caused by the trades, and to earthquake shocks. Navigators, by noting all the attendant circumstances when these phenomena are observed, will assist greatly in finding out the laws that govern them.

**CHANNELS.**—The islands of the Lesser Antilles are separated from each other by deep-water channels which connect the Atlantic Ocean with the Caribbean Sea. The most important of these channels are: Anegada Passage, over 30 miles wide between Sombrero Island on the east and the Virgin Group on the west.

Guadaloupe Passage, about 30 miles wide between Antigua and Montserrat on the northwestward and Guadaloupe on the southeastward.

Dominica Passage, about 13 miles wide between Marie Galante and Les Saintes on the north and Dominica on the south.

Martinique Passage, 22 miles in width, between Dominica on the north and Martinique on the south.

St. Lucia Channel, 17 miles in width, between Martinique on the north and St. Lucia on the south.

St. Vincent Passage, about 24 miles wide between St. Lucia on the north and St. Vincent on the south.

The passage between Grenada on the north and Trinidad and Tobago on the south about 72 miles wide.

In these channels, the current generally sets to the westward into the Caribbean. The current is the strongest in the southern passages, decreasing in velocity as the northern channels are reached until in the Anegada Passage there is no current other than the tides.

**Hydrographic information by radio.**—Hydrographic information for the Caribbean Sea is sent out from the United States naval radio station at Colon. All United States naval radio stations are prepared to receive urgent hydrographic information at any time. Those nearest the area covered by this book are St. Thomas, San Juan, Guantanamo, Navassa Island, and Colon.

For stations which send out weather bulletins, time signals, etc., see H. O. Pub. No. 205, Radio Aids to Navigation.

**ROUTES—General.**—The equatorial currents in the Caribbean, including those through the passages of the Lesser Antilles, set generally westward. Exceptions to this general westerly current are the Cuban countercurrent, which sets to the eastward along the southern coasts of Cuba and Haiti; and another countercurrent, greater in strength, which sets to the eastward and northeastward along the coast of Colombia. The Cuban countercurrent at the eastern end of Haiti turns toward the Mona Passage and there becomes weak and variable.

It will be observed that in general vessels bound eastward in this area must combat unfavorable currents and vessels bound westward have currents with them.

The routes are chosen in order to avoid or minimize, as far as possible, untoward currents and to take advantage of favorable ones. For instance, vessels bound for the eastern coast of South America are routed so as to avoid the full strength of the south equatorial current and finally to cross it at nearly right angles, thus reducing the time during which the full strength of the adverse current will be effective. Likewise, vessels bound from the eastern coast of South America are routed inshore to take full advantage of this current. The same considerations are applied in choosing between routes north or south of Cuba, Haiti, and Jamaica.

**INTERPORT ROUTES—Port of Spain to St. Thomas, Virgin Islands.**—Vessels entering or leaving the Gulf of Paria through the Dragons Mouth should use the Boca Grande. (See p. 283.)

Proceed through the Dragons Mouth and thence by rhumb line close to the westward of St. Croix. Distance, 516 miles.

A vessel may proceed to the eastward of Aves Island and St. Croix, but this route is not recommended although it is  $3\frac{1}{2}$  miles shorter. It causes St. Croix, with its outlying dangers, and Aves Island to lie to leeward.

**Port of Spain to La Guaira and Puerto Cabello.**—Proceed through the Dragons Mouth and thence north of the Testigos Islands, La Sola, Margarita Island, Tortuga, and Centinela Island to destination. Distance to La Guaira, 349 miles; to Puerto Cabello, 409 miles.

**Port of Spain to Willemstad.**—Proceed through the Dragons Mouth, thence north of the Testigos Islands and Los Hermanos. From a point north of Blanquilla Island steer to pass north of Los Roques and not less than 5 miles north of the Ave de Sotavento. After passing the Ave de Sotavento steer to pass south of Lacre Point, island of Bonaire, thence north of Little Curaçao, round the south end of Curaçao, and to destination. Distance, 469 miles.

**Port of Spain to Las Piedras Bay and Maracaibo.**—Proceed as for Willemstad, but from a point south of Curaçao continue westward to pass between Cape San Roman, on the Paraguana Peninsula, and Aruba and thence into the Gulf of Venezuela and to destination. Distance, to Las Piedras Bay, 576 miles; to Maracaibo anchorage off Isla de San Carlos, 650 miles.

**To Port of Spain.**—Take reverse of above routes.

**La Guaira to Puerto Cabello.**—Rhumb lines direct. Distance, 66 miles.

**La Guaira to Willemstad.**—Rhumb lines direct. Distance, 148 miles.

**La Guaira to Las Piedras Bay and Maracaibo.**—Rhumb line courses direct through the passage between the mainland and Aruba. Distance to Las Piedras Bay, 255 miles; to Maracaibo anchorage, 329 miles.

**La Guaira to St. Thomas, Virgin Islands.**—Pass to the eastward of Orchilla Island and thence directly to destination, passing to the westward of St. Croix. Distance, 488 miles.

**To La Guaira.**—Take the reverse of the above routes.

**Puerto Cabello to Willemstad.**—Steer a course to the westward of Mapleton Bank, whose existence is doubtful, and east of Sombrero and Borracho Cays. Upon passing Borracho Cay, steer for destination, avoiding Bordeaux Shoal en route. Distance, 112 miles.

**Puerto Cabello to Las Piedras Bay and Maracaibo.**—Same as for Willemstad, except that when south of Curaçao set course to pass between Aruba and Cape San Roman. Thence enter the Gulf of Venezuela and proceed to destination. Distance to Las Piedras Bay, 216 miles; to Maracaibo anchorage, off Isla de San Carlos, 290 miles.

**Puerto Cabello to St. Thomas, Virgin Islands.**—Pass to the westward of Los Roques and thence direct to destination by rhumb-line course. Distance, 506 miles.

**To Puerto Cabello.**—Take the reverse of above routes.

**From Las Piedras Bay and Maracaibo to St. Thomas, Virgin Islands.**—Pass out of the Gulf of Venezuela to the westward of Aruba and from the North Point of Aruba take direct rhumb-line course to destination. Distance from Las Piedras Bay, 507 miles; from Maracaibo, 575 miles.

**St. Thomas, Virgin Islands.**—To other ports in the area take reverse of routes from those ports to St. Thomas.

**COLON-SOUTH AMERICA TRACK.**—The track between Colon and the east coast of South America passes through the waters of this area and is given here because routes to and from the

ports in this area may be conveniently connected up to it. Distances over parts of this track are also available for other routes and will be referred to in order to avoid needless repetition.

The following route is recommended for use during the entire year, between Colon and Bahia. Different routes for the southbound and northbound voyages are necessary due to the constant strong equatorial current.

COLON TO BAHIA

	Miles
Entrance to Colon, to lat. 9° 45' N., long. 79° 40' W., rhumb-----	26
To lat. 13° 00' N., long. 71° 00' W., great circle-----	546
Cross long. 77° W. in lat. 10° 58' N.	
Cross long. 75° W. in lat. 11° 40' N.	
Cross long. 73° W. in lat. 12° 20' N.	
To lat. 12° 05' N. long. 63° 00' W., great circle-----	472
Cross long. 68° W. in lat. 12° 40' N.	
Cross long. 65° W. in lat. 12° 20' N.	
To lat. 11° 43' N., long. 61° 49' W., rhumb-----	73
To lat. 10° 00' N., long. 53° 23' W., great circle-----	500
Cross long. 60° W. in lat. 11° 20' N.	
Cross long. 57° W. in lat. 10° 45' N.	
To lat. 0° 00', long. 37° 00' W., great circle-----	1, 148
Cross long. 50° W. in lat. 8° N.	
Cross long. 45° W. in lat. 5° N.	
Cross long. 40° W. in lat. 1° 50' N.	
To lat. 5° 25' S., long. 34° 25' W., rhumb-----	360
To lat. 7° 35' S., long. 34° 30' W., rhumb-----	130
To lat. 9° 10' S., long. 35° 00' W., rhumb-----	100
To lat. 10° 10' S., long. 35° 35' W., rhumb-----	69
To lat. 13° 08' S., long. 38° 24' W., rhumb-----	244
To lat. 13° 05' S., long. 38° 34' W., rhumb (entrance to Bahia)-----	10
From entrance to anchorage-----	7
Total-----	3, 685

Generally adverse currents are prevalent and can not be entirely avoided. The route recommended is so laid as to avoid the maximum strength of the adverse currents, and to take advantage of such favorable current as exists without unduly increasing the distance. In general, 145 miles adverse current may be expected as a yearly average.

**Colon to Pernambuco,** leave the above track at lat. 7° 35' S., long. 34° 30' W. and proceed direct to destination.

**Colon to Bahia** and thence proceeding to other ports further south, proceed by rhumb-line course from the position lat. 13° 05' S., long. 38° 34' W., off Bahia, to lat. 18° 00' S., long. 38° 20' W.; thence to lat. 22° 10' S., long. 40° 40' W., off Cape St. Thome. If bound for Rio de Janeiro or Santos proceed directly from the latter position. If not calling at Bahia steer directly by rhumb-line course from the position lat. 9° 10' S., long. 35° 00' W., to lat. 18° 00' S., long. 38° 20' W., and thence proceed.



**Colon to Montevideo or Buenos Aires,** take a great circle course from lat.  $22^{\circ} 10' S.$ , long.  $40^{\circ} 40' W.$ , off Cape St. Thome, to lat.  $34^{\circ} 30' S.$ , long.  $53^{\circ} 40' W.$ ; thence rhumb-line course to lat.  $35^{\circ} 10' S.$ , long.  $55^{\circ} 00' W.$ , thence to sight the English Bank and Recalada light vessels and thence to destination.

**Colon to Bahia Blanca,** with no call at Montevideo or Buenos Aires, take a great-circle course from lat.  $22^{\circ} 10' S.$ , long.  $40^{\circ} 40' W.$ , to lat.  $38^{\circ} 12' S.$ , long.  $57^{\circ} 23' W.$ , off Mogotes Point, and thence to Bahia Blanca.

**Distances** from Cape San Roque ( $5^{\circ} 25' S.$ ,  $34^{\circ} 25' W.$  south-bound) to Pernambuco 167 miles; to Bahia, 560 miles; to Rio de Janeiro direct 1,238 miles; to Rio via Bahia, 1,305 miles; to Santos direct, 1,431 miles; to Santos via Bahia, 1,498 miles; to Santos via Rio, 1,499 miles; to Santos via Bahia and Rio, 1,566 miles; to Montevideo direct, 2,231 miles; to Buenos Aires direct, 2,341 miles; to Bahia Blanca direct, 2,614 miles.

The position off Cape San Roque is taken as lat.  $5^{\circ} 00' S.$ , long.  $34^{\circ} 40' W.$ , northbound.

**TO SOUTH AMERICAN PORTS FROM PORTS IN THE AREA—From Maracaibo.**—(Anchorage off Isla de San Carlos in 5 to 6 fathoms (9.1 to 11 m.) 30 miles from the city of Maracaibo.) Proceed by direct rhumb-line courses to the southward of Aruba and thence north of Curaçao and Bonaire to join the Colon-South American track in lat.  $12^{\circ} 05' N.$ , long.  $63^{\circ} 00' W.$ , and thence on that track. Distance Maracaibo anchorage to lat.  $12^{\circ} 05' N.$ , long.  $63^{\circ} 00' W.$ , 532 miles; to Cape San Roque, 2,613 miles.

**From Las Piedras Bay.**—Same as from Maracaibo. Distance to lat.  $12^{\circ} 05' N.$ , long.  $63^{\circ} 00' W.$ , 458 miles; to Cape San Roque, 2,539 miles.

**From Willemstad.**—Proceed around the south end of Curaçao and Bonaire and giving the dangerous Islas de Aves a generous clearance, steer to join the Colon-South American track in lat.  $12^{\circ} 05' N.$ , long.  $63^{\circ} 00' W.$ , and thence proceed on that track. Distance to lat.  $12^{\circ} 05' N.$ , long.  $63^{\circ} 00' W.$ , 343 miles; to Cape San Roque, 2,424 miles.

**From Puerto Cabello.**—Steer rhumb-line courses to pass to the northward of Tortuga and the Testigos Islands. When clear of the Testigos Islands steer to intersect the Colon-South American track northwest of Tobago Island, in about lat.  $11^{\circ} 32' N.$ , long.  $61^{\circ} 07' W.$ , and thence proceed on that track. Distance to position off Tobago, 415 miles; to Cape San Roque, 2,388 miles.

**From La Guaira.**—Pass to the northward of Centinela Island, Tortuga, Margarita Island, and the Testigos Islands, giving La Sola a good berth en route. When clear of the Testigos Islands steer to

intercept the Colon-South American track northwest of Tobago Island in about lat.  $11^{\circ} 32' N.$ , long.  $61^{\circ} 07' W.$ , and thence continue on that track. Distance to position off Tobago Island, 351 miles; to Cape San Roque, 2,324 miles.

**From Port of Spain.**—Proceed through the Dragons Mouth and thence by rhumb lines between Trinidad and Tobago Island to join the Colon-South American track in lat.  $10^{\circ} 00' N.$ , long.  $53^{\circ} 23' W.$ , and thence continue on that track. Distance to lat.  $10^{\circ} 00' N.$ , long.  $53^{\circ} 23' W.$ , 522 miles; to Cape San Roque, 2,030 miles.

**From St. Thomas, Virgin Islands.**—Proceed by rhumb-line course to the eastward of St. Croix and to the southward of Dominica and thence through the Martinique Passage (between Martinique and Dominica). After clearing Caravella Rock, northeast coast of Martinique, steer a great-circle course to intersect the southbound Colon-South American track on the Equator in long.  $37^{\circ} 00' W.$  and thence continue on that track. Distance to Cape San Roque, 2,348 miles. If rhumb-line course instead of a great-circle is steered after leaving Martinique Passage, add 8 miles to distance.

**SOUTH AMERICA-COLON TRACK.**—The South America-Colon track is considerably different from the Colon-South America track between Cape San Roque and the Lesser Antilles, on account of current. The route recommended by the Hydrographic Office and published on Pilot Charts of the South Atlantic Ocean and of Central American Waters is in detail as follows:

BAHIA TO COLON

	Miles
Anchorage to entrance to Bahia ( $13^{\circ} 05' S.$ , $38^{\circ} 34' W.$ ).....	7
To lat. $13^{\circ} 08' S.$ , long. $38^{\circ} 24' W.$ , rhumb.....	10
To lat. $10^{\circ} 10' S.$ , long. $35^{\circ} 35' W.$ , rhumb.....	244
To lat. $9^{\circ} 10' S.$ , long. $35^{\circ} 00' W.$ , rhumb.....	69
To lat. $7^{\circ} 25' S.$ , long. $34^{\circ} 40' W.$ , rhumb.....	100
To lat. $5^{\circ} 00' S.$ , long. $34^{\circ} 40' W.$ , rhumb.....	155
To lat. $12^{\circ} 05' N.$ , long. $63^{\circ} 00' W.$ , great circle.....	1,977
Cross Equator in long. $42^{\circ} 50' W.$	
Cross lat. $5^{\circ} 00' N.$ , long. $51^{\circ} 00' W.$	
Cross lat. $10^{\circ} 00' N.$ , long. $59^{\circ} 20' W.$	
To lat. $13^{\circ} 00' N.$ , long. $71^{\circ} 00' W.$ , great circle.....	472
Cross long. $65^{\circ} W.$ in lat. $12^{\circ} 20' N.$	
Cross long. $68^{\circ} W.$ in lat. $12^{\circ} 40' N.$	
To lat. $9^{\circ} 45' N.$ , long. $79^{\circ} 40' W.$ , great circle.....	546
Cross long. $73^{\circ} W.$ , lat. $12^{\circ} 20' W.$	
Cross long. $75^{\circ} W.$ , lat. $11^{\circ} 40' W.$	
Cross long. $77^{\circ} W.$ , lat. $10^{\circ} 58' W.$	
From entrance to Colon.....	26
Total.....	3,606

The currents in general are favorable and the above route is laid to take best advantage thereof without departing unduly from the shortest navigable distance. A total of approximately 315 miles of favorable current may be expected as a yearly average.

It will be noted that the northbound track diverges from the southbound at lat.  $9^{\circ} 10' S.$ , long.  $35^{\circ} 00' W.$ , and rejoins it at the position lat.  $12^{\circ} 05' N.$ , long.  $63^{\circ} 00' W.$

**Distances** from ports on the east coast of South America to Cape San Roque ( $5^{\circ} 00' S.$ ,  $34^{\circ} 40' W.$  *northbound*).—

From Bahia Blanca direct, 2,636 miles; from Buenos Aires direct, 2,363 miles; from Montevideo direct, 2,253 miles; from Santos direct, 1,453 miles; from Rio de Janeiro direct, 1,260 miles; from Rio de Janeiro via Bahia, 1,327 miles; from Bahia direct, 582 miles; from Bahia via Pernambuco, 582 miles; from Pernambuco direct, 188 miles. From Bahia Blanca to Buenos Aires, 588 miles; from Bahia Blanca to Montevideo, 478 miles; from Buenos Aires to Montevideo, 125 miles; from Recalada Light Vessel to Santos, 895 miles; from Santos to Rio de Janeiro, 214 miles; from Rio de Janeiro to Bahia, 745 miles; from Rio de Janeiro to Pernambuco, 1,073 miles; from Bahia to Pernambuco, 395 miles.

**FROM SOUTH AMERICAN PORTS TO PORTS IN THE AREA—To Port of Spain.**—From the position lat.  $5^{\circ} 00' S.$ , long.  $34^{\circ} 40' W.$ , off Cape San Roque, steer a great-circle course to a position in the passage between Trinidad and Tobago Island, about lat.  $10^{\circ} 55' N.$ , long.  $61^{\circ} 00' W.$ , and thence through the Dragon's Mouth to destination. Distance Cape San Roque to Port of Spain, 1,911 miles.

Vessels drawing not more than 28 feet may use the Serpents Mouth, the southern entrance to the Gulf of Paria, but this route is emphatically not recommended, as it is 5 miles longer than the route through the Dragons Mouth and involves much more difficult and dangerous navigation. If for any reason it is used, a great circle from Cape San Roque to pick up the southeast extremity of Trinidad in about lat.  $10^{\circ} 00' N.$ , long.  $61^{\circ} 00' W.$ , should be taken. Thence pass along the southern coast of Trinidad and through the Serpents Mouth, using either the Eastern or Middle Channel. (For channels through the Serpents Mouth, see p. 308.) Distance, 1,916 miles.

**To La Guaira and Puerto Cabello.**—Follow the South America-Colon track through the passage between Trinidad and Tobago Island and from about lat.  $11^{\circ} 00' N.$ , long.  $61^{\circ} 00' W.$ , steer so as to pass well north of the Testigos Islands, north of Margarita Island and Tortuga, giving La Sola and Centinela Island a comfortable berth, and to destination. Distance Cape San Roque to La Guaira, 2,206 miles; to Puerto Cabello, 2,268 miles.

**To Las Piedras Bay, Maracaibo and Willemstad.**—Follow the South America-Colon track to the position  $12^{\circ} 05' N.$ , long.  $63^{\circ} 00'$

W., and thence take the reverse of the routes from those ports to the east coast of South America. Distance Cape San Roque to Las Piedras Bay, 2,435 miles; to Maracaibo, 2,509 miles; to Willemstad, 2,320 miles.

**To St. Thomas, Virgin Islands.**—From the position lat.  $5^{\circ} 00'$  S., long.  $34^{\circ} 40'$  W., off Cape San Roque, steer great-circle course, 1,925 miles, or rhumb-line course, 1,933 miles, to a position in the St. Vincent Passage, between St. Vincent and St. Lucia, thence rhumb-line course to pass to the eastward of Lang Bank, lying to the eastward of St. Croix, and thence to destination. Distance Cape San Roque to St. Thomas, 2,290 miles by great-circle course, or 2,298 miles by rhumb-line one.

**TO EUROPEAN PORTS.**—Bound for Europe from ports in this area there is, in most cases, a choice of several routes through the Lesser Antilles. In this connection it may be pointed out that the shortest routes are not always apparent from a casual inspection of the charts. The routes described are the shortest, having been selected as the result of computation.

The entrance to the Strait of Gibraltar is taken as lat.  $35^{\circ} 57'$  N., long.  $5^{\circ} 45'$  W.; that of the English Channel as lat.  $49^{\circ} 20'$  N., long.  $5^{\circ} 00'$  W.

**From Port of Spain.**—For the English Channel proceed through the Dragon's Mouth and to a position off Harrison Point Light, Barbados, by rhumb courses and thence take the great circle. For the Strait of Gibraltar take great-circle course direct upon clearing the Dragon's Mouth, passing to the southward of Barbados. Distance to English Channel, 3,665 miles; to Strait of Gibraltar, 3,402 miles.

**From La Guaira.**—Steer rhumb-line courses to a position about 10 miles southeast of Orchilla Island, Los Roques, and thence, if bound for the English Channel, direct to a position in the Guadeloupe Passage, between Guadeloupe and Antigua, and thence great-circle. If bound for Gibraltar, steer direct to a position in the Martinique Passage, between Martinique and Dominica, and thence take a great-circle course. Distance to Strait of Gibraltar, 3,636 miles; to English Channel, 3,833 miles.

**From Puerto Cabello.**—Steer a rhumb-line course to pass about 5 miles southeast of Cayo Grande, Los Roques, and thence, if for the English Channel, direct to the Guadeloupe Passage, between Guadeloupe and Antigua, and thence a great-circle course. If bound to Strait of Gibraltar, from Cayo Grande steer for the Martinique Passage, between Martinique and Dominica, and thence a great-circle course. Distance to English Channel, 3,880 miles; to Strait of Gibraltar, 3,681 miles.

**From Willemstad.**—Proceed around south end of Curaçao, thence north of Bonaire, and from North Point, Bonaire, if bound for the English Channel, steer rhumb-line courses for a position off Sombrero Island, passing through the Anegada Passage, and then a great-circle course. If bound for Gibraltar, from North Point, Bonaire, steer rhumb-line course for a position in the Guadeloupe Passage, between Guadeloupe and Antigua, passing to the eastward of Aves Island (lat.  $15^{\circ} 42' N.$ , long.  $63^{\circ} 38' W.$ ) en route, and thence great-circle course. Distance to English Channel, 3,849 miles; to Strait of Gibraltar, 3,688 miles.

**From Las Piedras Bay.**—Round La Macolla Point and thence, if bound for the English Channel, pass to the westward of Aruba. From the North Point of Aruba steer rhumb-line courses through the Anegada Passage to a position off Sombrero Island and thence a great-circle course. If bound for the Strait of Gibraltar, pass to the southward of Aruba and to the northward of Curaçao to the Dominica Passage, between Guadeloupe and Dominica, and thence by great-circle course. Distance to Strait of Gibraltar 3,774 miles; to English Channel, 3,925 miles.

**From Maracaibo.**—From the anchorage off Isla de San Carlos 30 miles from the city, pass 10 to 15 miles to the eastward of Monge del Este and to the westward of Aruba. From the North Point of Aruba, if bound for the English Channel, steer rhumb-line course through the Anegada Passage and take the great-circle course from a position off Sombrero Island. If bound for the Strait of Gibraltar proceed through the Guadeloupe Passage, between Guadeloupe and Antigua, and then take a great-circle course. Distance to Sombrero Island, 626 miles; to Guadeloupe Passage, 649 miles; to Strait of Gibraltar, 3,819 miles; to English Channel, 3,959 miles.

**From St. Thomas, Virgin Islands.**—Proceed to a position off Sombrero Island and then by a great-circle course. Distance to English Channel, 3,430 miles; to Strait of Gibraltar, 3,293 miles. By traversing the Virgin Passage and thence taking a great-circle course, the distance to English Channel is the same, 3,430 miles, but that to the Strait of Gibraltar is increased 18 miles.

**FROM EUROPEAN PORTS.**—Entrance to English Channel ( $49^{\circ} 20' N.$ ,  $5^{\circ} 00' W.$ ). Entrance to Strait of Gibraltar ( $35^{\circ} 57' N.$ ,  $5^{\circ} 45' W.$ ). It will be noted that from the ports of this area to the English Channel and the Strait of Gibraltar the routes given are direct great-circle courses across the Atlantic. This is for both high-powered and low-powered steamers in all seasons. But in the reverse direction, from the English Channel and the Strait of Gibraltar to these ports, the Hydrographic Office recommends seasonal

routes across the Atlantic for low-powered steamers. The seasonal routes are chosen so as to minimize the encountering of adverse winds, current, and bad weather. On occasion, these seasonal routes may be followed with profit by high-powered steamers.

The routes across the Atlantic recommended for low-powered steamers are given below. The same passages through the Lesser Antilles (Windward Islands) named heretofore for voyages to the English Channel and the Strait of Gibraltar should be used, and the reverse of the tracks through the Caribbean.

**From the English Channel.**—May 1 to September 30: For the Anegada or Guadeloupe Passages take a great-circle course to the position lat.  $36^{\circ} 00' N.$ , long.  $34^{\circ} 33' W.$  and thence another great-circle course. For other passages and for Port of Spain take great-circle direct. October 1 to April 30: For the Anegada or Guadeloupe Passages take a great-circle course to the position lat.  $33^{\circ} 00' N.$ , long.  $38^{\circ} 33' 20'' W.$  and thence another great-circle course. For other passages and Port of Spain take great-circle direct.

**From the Strait of Gibraltar.**—May 1 to September 30: Take the great-circle direct; the reverse of the routes to the Strait of Gibraltar. October 1 to April 30: For the Anegada or Guadeloupe Passages take rhumb-line course to the position lat.  $33^{\circ} 00' N.$ , long.  $20^{\circ} 00' W.$  and thence a great-circle. For other passages and Port of Spain take the great-circle course direct.

For Table of Distances see route chart facing page 55.

**TO NORTHERN PORTS OF THE UNITED STATES—From Port of Spain.**—Proceed through the Dragons Mouth and to a position about 3 miles off Saline Point, Grenada. Thence steer for a position off Sombbrero Island, passing between St. Eustatius and the Saba Bank and to the eastward of Saba Island. From Sombbrero Island steer rhumb-line courses to destination. Distance to Sombbrero Island, 507 miles; to Boston, via Nantucket Shoals Light Vessel, 2,020 miles; to Ambrose Light Vessel, New York, 1,924 miles; to Five-Fathom Bank Light Vessel, via Fenwick Island Shoal Light Vessel, 1,860 miles; to Chesapeake Light Vessel, 1,784 miles.

**From La Guaira, Puerto Cabello, Willemstad, Las Piedras Bay, and Maracaibo.**—Steer rhumb-line courses for the Mona Passage and from a position about 7 miles off Cape Engano steer rhumb lines to destination. In proceeding from Willemstad to Cape Engano pass around the west end of Curaçao. This route is 10 miles shorter than the one around the south end of the island. Distances to Cape Engano from La Guaira, 486 miles; from Puerto Cabello, 485 miles; from Willemstad, 404 miles; from Las Piedras Bay, 438 miles; from Maracaibo (anchorage), 497 miles.



**From Cape Engano to Boston** via Nantucket Shoals Light Vessel, 1,377 miles; to Ambrose Light Vessel, 1,343 miles; to Five-Fathom Bank Light Vessel via Fenwick Island Shoal Light Vessel, 1,264 miles; to Chesapeake Light Vessel, 1,171 miles.

**From St. Thomas, Virgin Islands.**—Round Sail Rock, proceed through the Virgin Passage and thence take rhumb-line courses to destination. Distance to Boston, 1,530 miles; to Ambrose Light Vessel, 1,421 miles; to Five-Fathom Bank Light Vessel, 1,351 miles; to Chesapeake Light Vessel, 1,269 miles.

**FROM NORTHERN PORTS OF THE UNITED STATES.**—Take reverse of routes to those ports, as given above.

**TO HABANA AND KEY WEST**—**From Port of Spain.**—Proceed through the Dragons Mouth and thence by rhumb-line course to the Mona Passage, passing eastward of the Testigos Islands. After clearing Cape Engano proceed along the north coasts of Haiti and Cuba to destination, taking advantage of favorable currents as far as the Straits of Florida. Pass through the Old Bahama and Nicholas Channels. Distance to Cape Engano, 625 miles; to Habana, 1,480 miles; to Key West, 1,473 miles.

**From La Guaira, Puerto Cabello, Willemstad, Las Piedras Bay, and Maracaibo.**—Proceed by rhumb-line courses via the Windward Passage, and after rounding Cape Maysi proceed through the Old Bahama and Nicholas Channels. Distance to Habana from Cape Tiburon, 631 miles; from La Guaira, 1,274 miles; from Puerto Cabello, 1,241 miles; from Willemstad, 1,130 miles; from Las Piedras Bay, 1,105 miles; from Maracaibo, 1,131 miles. To Key West subtract 7 miles from the above distances.

**From St. Thomas.**—Round Sail Rock and proceed through the Virgin Passage and thence along the north coasts of Puerto Rico, Haiti, and Cuba, carrying favorable current as far as the Straits of Florida. Distance to Habana, 1,052 miles; to Key West, 1,045 miles.

**From Habana and Key West.**—To all ports in this area take the reverse of the routes to Habana and Key West. In the case of St. Thomas the route along the north coasts of Cuba, Haiti and Puerto Rico will offer unfavorable current throughout most of its length but it is 140 miles shorter than the route through the Windward Passage and thence along the south coasts of Haiti and Puerto Rico. For a 12-knot ship the northern route has 70 miles net of unfavorable current and the southern route 6 miles net.

**To Mobile, New Orleans, and Galveston—From Port of Spain, La Guaira, Puerto Cabello, Willemstad, Las Piedras Bay, and Maracaibo.**—Steer direct rhumb lines to pass to the southward of Jamaica, passing between that island and the Pedro Bank, and thence to a position off Cape San Antonio, passing between Grand Cayman and Little Cayman en route. From Cape San Antonio steer rhumb-line courses to destination. This route takes advantage of favorable current and avoids the numerous uncertain dangers, some of which are hard to pick up in thick weather, which extend to the southwestward from Pedro Bank. Distance to position off Cape San Antonio from Port of Spain, 1,530 miles; from La Guaira, 1,245 miles; from Puerto Cabello, 1,206 miles; from Willemstad, 1,098 miles; from Las Piedras Bay, 1,052 miles; from Maracaibo, 1,075 miles. From Cape San Antonio to Mobile Entrance, 525 miles; to South Pass Light Vessel, 483 miles; to Heald Bank Light Vessel, 662 miles.

**From St. Thomas, Virgin Islands.**—Proceed through the Virgin Passage and thence along the north shores of Puerto Rico, Haiti, and Cuba, carrying favorable current as far as the Straits of Florida. Upon leaving Nicholas Channel cross the Gulf Stream, in the Straits of Florida, to a position lat. 24° 25' N., long. 83° 00' W., off the Dry Tortugas, and thence take rhumb-line courses to destination. Distance to Loggerhead Key, 1,098 miles; to Mobile Entrance, 1,536 miles; to South Pass Light Vessel, 1,526 miles; to Heald Bank Light Vessel, 1,764 miles.

**FROM MOBILE, NEW ORLEANS, AND GALVESTON—To southern ports of the area.**—Proceed to Cape San Antonio and thence along the southern coast of Cuba and north of Jamaica, taking advantage of the eastward-setting Cuban countercurrent and avoiding the unfavorable current to the southward of Jamaica. For Maracaibo, Las Piedras Bay, Willemstad, Puerto Cabello, and La Guaira pass between Jamaica and Navassa Island. For Port of Spain pass close to Navassa Island and proceed as far as Alta Vela under the influence of the Cuban countercurrent before changing course directly for destination. Pass to the north and east of Los Testigos.

**To St. Thomas, Virgin Islands.**—From Cape San Antonio pass close along the southern coasts of Cuba, Haiti, and Puerto Rico to destination, carrying favorable current from Cape San Antonio as far as the Mona Passage. From a position off Cape Santa Cruz, Cuba, steer to pick up Point Gravois, Haiti, passing just north of Navassa Island and minding the Formigas Bank, on which there is a least depth of 2½ fathoms. Distances to Cape San Antonio from Mobile Entrance, 525 miles; from South Pass Light Vessel,

438 miles; from Heald Bank Light Vessel, 662 miles. From Cape San Antonio to Maracaibo, 1,104 miles; to Las Piedras Bay, 1,081 miles; to Willemstad, 1,115 miles; to Puerto Cabello, 1,225 miles; to La Guaira, 1,262 miles; to Port of Spain, 1,529 miles; to St. Thomas, 941 miles.

**TO COLON—From Port of Spain.**—Proceed through the Boca Grande Channel of the Dragons Mouth and thence, rounding the Testigos Islands at a safe distance and passing well north of Los Hermanos and Blanquilla Island, join the South America-Colon track in lat.  $12^{\circ} 20' N.$ , long.  $65^{\circ} 00' W.$ , and continue thereon to destination. Distance to Colon entrance, 1,163 miles. This distance will be increased by 3 miles if rhumb-line courses are steered throughout instead of a great-circle course on that part of the South America-Colon track followed.

**From La Guaira.**—Proceed by rhumb lines to a position to the southward of Aruba, thence between Aruba and the mainland and to the northward of Los Monges to intercept the South America-Colon track northwest of Gallinas Point, in about lat.  $12^{\circ} 41' N.$ , long.  $72^{\circ} 00' W.$ , and continue thereon to destination. Distance, 842 miles.

**From Puerto Cabello.**—Pass to the westward of Mapleton Bank (E. D.) and thence, giving the mainland a comfortable berth and minding especially the Bordeaux Shoal ( $11^{\circ} 25' N.$ ,  $68^{\circ} 37' W.$ ), pass to the westward of Curaçao. Thence pass south of Aruba and north of Los Monges to join the South America-Colon track northwest of Gallinas Point in about lat.  $12^{\circ} 41' N.$ , long.  $72^{\circ} 00' W.$ , and thence continue on that track. Distance, 801 miles.

**From Las Piedras Bay and Maracaibo.**—Pass out of the Gulf of Venezuela, steering between Los Monges and the mainland (La Guajira Peninsula). Join the South America-Colon track northwest of Gallinas Point, in about lat.  $12^{\circ} 41' N.$ , long.  $72^{\circ} 00' W.$ , and continue thereon to destination. Distance from Las Piedras Bay, 634 miles; from Maracaibo, 657 miles.

**From Willemstad.**—Proceed to the southward of Aruba and to the northward of Los Monges. Join the South America-Colon track in about lat.  $12^{\circ} 41' N.$ , long.  $72^{\circ} 00' W.$ , and continue thereon to destination. Distance, 695 miles.

**From St. Thomas.**—After clearing the Virgin Islands steer a great circle to the position lat.  $9^{\circ} 45' N.$ , long.  $79^{\circ} 40' W.$ , off Manzanillo Point and the Farallon Sucio, and thence rhumb-line course to Colon entrance. Distance, 1,027 miles; by rhumb lines throughout, 1,032 miles.

**From Colon.**—To ports in this area take the reverse of routes from those ports to Colon.





## CHAPTER II

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### THE VIRGIN ISLANDS

**THE VIRGIN GROUP** (*H. O. Chart 1002*) of about 100 small islands and cays was discovered by Columbus on his second voyage in 1494. For some time they were chiefly in the hands of the buccaneers, but in 1666 Tortola, Virgin Gorda, and Anegada became the possessions of the British, and in 1672 the Danes colonized St. Thomas and St. John. The first settlers at St. Croix (Santa Cruz) were the Dutch, in 1643, but it afterwards passed successively into the hands of British, Spaniards, French, and Danes; and in 1917 it, with the other Danish Islands, was sold by the latter to the United States. The western portion, sometimes called Passage Islands, also possessions of the United States, includes Culebra, Vieques or Crab Island, and the small islets between them and Porto Rico.

The line of demarcation between the English islands and those of the United States runs from the north between Little Tobago and Hans-Lollik; from thence to the channel between Thatch Island, Tortola, and St. John, round the eastern end of the latter, and thence through Flanagan Passage.

The population of the United States group was 26,050 in 1918, of whom 1,925 were white, the rest were either Negro or mixed, and the British group had a population of 5,082 in 1921. The amount of trade is small.

The standard time of the Virgin Islands of the United States is that of long. 60° W.

**Aspect.**—On making the Virgin Islands from the northward, Virgin Gorda will be seen on the extreme left, rising in a clear, well-defined peak 1,370 feet (417.5 m.) high. Anegada being only 30 feet (9.1 m.) above the sea, will not be seen more than 5 or 6 miles from an elevation of 10 feet (3.0 m.). Next to Virgin Gorda, Tortola will appear the most conspicuous; Sage Mountain, the highest in the island, does not rise into a peak from this direction, but appears flattened and elongated; its height is 1,780 feet (542.1 m.). Immediately to the westward of it will be seen the rugged pointed peaks of Jost Van Dyke, 1,070 feet (325.7 m.) high, and behind

them the irregular small peaks rising from the table-land of St. John, and varying in elevation from 800 to 1,225 feet (243.8 to 373.0 m.).

From about 20 miles to the northward of the islands, on or near the meridian of  $64^{\circ} 50'$  W., a separation will be observed between St. John and St. Thomas, as the small cays which lie off and between them will not be seen; but the other islands, viz, Virgin Gorda, Tortola, Jost Van Dyke, and St. John, will appear as one large island, the prominent peaks on each being alone distinguishable.

Guinea grass grows in abundance on the hillsides, and the forests include many useful trees, among which are mahogany and fustic.

The island of St. Thomas may be recognized by having a large saddle on its center, formed by Signal Hill and Crown Mountain, the former 1,499 feet (456.5 m.), the latter 1,549 feet (471.7 m.) high; and the island is less rugged in outline than the others. This saddle is equally conspicuous from the southward. Culebra from the above position will be only just in sight. Its hills are more rounded than the others and much less elevated, being not more than 650 feet (198.1 m.) high.

**Tides and tidal currents.**—The phenomena of the tides among the Virgin Islands, although of great importance to navigators, are extremely difficult of explanation. The following rule is given by the fishermen, and in general it may be safely adopted: From the moon's rising until her meridian passage the flood runs to the south-eastward or to windward, and from thence to her setting the ebb runs to the northwestward or to leeward, and vice versa, with the lower transit; hence there is a 6-hour current each way. This rule, however, is greatly modified in different localities and by the force and direction of the wind.

It is observed that the southern tide predominates during the summer months, from the middle of June to the middle of August, and two tides have been then known to follow in succession, particularly if the wind has been westerly; and on such occasions the rise was increased by 2 feet (0.6 m.) Near the commencement of this remarkable change the current is observed to set for 8 or 10 days continually to the southward with unusual force, and is called by the fishermen "St. John's tide" from its occurring near the day of that saint. For the remainder of the above period the ebb or northerly current will run only for about one or two hours.

During the months of September, November, March, and April the northern tide prevails, being assisted by the current. At this period also the highest water is generally in the morning, and there is only a half tide in the evening; the reverse takes place during the summer months.



The tides of the Virgin Islands are chiefly diurnal in character with a mean high water interval of 7 h. 30 m., referring to the upper transit at north declination or to lower transit at south declination of the moon.

**Virgin Bank** (*C. S. Charts 904 and 905*).—It will be seen by the chart that the extensive group of the Virgin Bank lies on the southern edge of a bank of soundings, stretching from Porto Rico to the eastern end of Anegada, and on the meridian of  $64^{\circ} 40'$  W. as far to the northward as lat.  $18^{\circ} 51'$  N., about 15 miles west-northwest of the western end of Anegada, whence the edge gradually approaches to within  $1\frac{1}{2}$  miles of the north side of that island. From the above position it trends to the southwestward about 17 miles, when it assumes a more westerly direction, and runs nearly in a straight line for the northeastern point of Porto Rico. It will, therefore, be seen that the bank extends about 14 miles to the northward of St. Thomas, increasing to 23 miles on the same side of Tortola.

On the southern side of the group the edge of the bank lies only  $1\frac{1}{4}$  miles from Norman Island; thence it takes a southwestern direction to the meridian of the western end of St. John, when it trends to the westward, passing about 7 miles from the southern sides of St. John and St. Thomas and 2 miles from Vieques Island.

The soundings on the southern side of the islands differ in a remarkable manner from those on the north. Here the edge of the bank, bold and wall-sided, lies at the distance of from 1 to 7 miles from the cays, and close within it is a narrow ledge of coral, about 200 yards wide, with a depth of from 15 to 19 fathoms (27.4 to 34.7 m.), which continues unbroken from the Horseshoe Reef at Anegada nearly to Vieques Island, having immediately within it from 25 to 30 fathoms (45.7 to 54.9 m.) of water.

The general depth on the northern side of the islands is from 28 to 30 fathoms, (51.2 to 54.9 m.) coral sand, with rocky patches from  $\frac{1}{2}$  mile to 4 miles in extent, on which the soundings vary from 6 to 15 fathoms (11.0 to 27.4 m.) and 20 fathoms (36.6 m.). These patches lie from 2 to 7 miles from the edge of the bank. Eastward of  $60^{\circ} 40'$  the depth is from 15 to 22 fathoms (27.4 to 40.2 m.), shoaling to 7 fathoms (12.8 m.) on nearing the western end of Anegada.

**Whale Banks** ( $18^{\circ} 42'$  N.,  $64^{\circ} 43'$  W.) are the most northern of the patches on Virgin Bank; the southern bank, having a least depth of 10 fathoms (18.3 m.), is in the shape of an oval, about 2 miles long by  $1\frac{1}{2}$  broad within the 20-fathom (36.6 m.) curve. The northern bank is about 3 miles long and from  $1\frac{1}{2}$  to 2 miles wide, with depths of from 12 to 20 fathoms (21.9 to 36.6 m.).

**Turtle Head** is a small coral patch, lying southwestward of the Whale, with as little as 6 fathoms (11.0 m.) of water on it. At  $\frac{1}{4}$  mile northward there is a depth of 25 fathoms (45.7 m.), while to the southward uneven ground extends nearly  $1\frac{1}{2}$  miles, with soundings of from 11 to 18 fathoms (20.1 to 32.9 m.). When on the head, the westernmost hill on St. John will be seen over the western portion of Jost Van Dyke, bearing  $180^\circ$ , and Virgin Gorda Peak  $111^\circ$ .

**Barracouta Banks** are several patches with from 11 to 20 fathoms (20.1 to 36.7 m.) of water on them, and lie from 7 to 12 miles  $313^\circ$  from the western portion of Jost Van Dyke, the shoalest parts being at their northeastern and northwestern ends.

**Kingfish Banks** are two coral patches, each about a mile long and  $\frac{1}{2}$  mile wide, with 8 fathoms (14.6 m.) of water on them; they are 1 mile apart, with a depth of 23 fathoms (42.1 m.) between. When on the northern bank the highest peak of Jost Van Dyke bears  $211^\circ$  and Guano Island Peak  $119^\circ$ .

With the exception of some rocky patches, having from 14 to 18 fathoms (25.6 to 32.9 m.) of water on them, the above are the only off-lying shoals on the northern side of the group.

**THE VIRGIN PASSAGE** (*C. S. Chart 904*).—This passage is 8 miles wide between Savana Island and Culebrita. The depths vary from 12 to 20 fathoms (21.9 to 36.6 m.) in the southern to 17 to 27 fathoms (31.1 to 49.4 m.) in the northern portion. It is quite clear, with the exception of the Grampus Shoals on the southwestern side and Sail Rock on the southeastern side.

**Grampus Shoals** is a group of small coral heads rising from a bank of 10 fathoms (18.3 m.) and lying 2 to 4 miles from the southeastern extremity of Culebra. The southernmost head, on which there is a depth of  $4\frac{3}{4}$  fathoms (8.7 m.), lies 4.1 miles  $171^\circ$  from Culebrita Island Light. About 2 miles northeastward of this is the most eastward head on which there is a depth of  $4\frac{3}{4}$  fathoms (8.7 m.). About midway between is found a small cluster of coral heads with a least depth of  $3\frac{1}{4}$  fathoms (5.9 m.). The southern of the innermost or western heads, with 3 fathoms (5.5 m.) of water, lies 3 miles  $184^\circ$  from Culebrita Island Light.

**Buoys**.—A red nun buoy marked "Grampus" lies in about 12 fathoms (21.9 m.) on the southern side of the shoals.

A black can buoy, No. 1, marks the northern edge of the western heads of these shoals.

**Sail Rock**, so called from its resemblance to a vessel under sail, rises precipitously from the sea to the height of 125 feet (38.1 m.). It is about 100 yards in diameter, quite barren, with a light grayish appearance. About 200 yards to the west-southwestward of it there

is a small rock nearly awash, the only danger near it; on all other sides it is bold and steep-to. Sail Rock lies  $3\frac{1}{4}$  miles  $195^\circ$  from Savana Island, and is a remarkable object when seen from off the harbor of St. Thomas. (See view 3, Appendix V.)

**Sail Rock Light.**—A flashing white light, visible 9 miles, is shown at an elevation of 125 feet (38.1 m.) from a stone-colored structure on the summit of Sail Rock. (See Light List.)

**Tidal currents.**—In the middle of the passage the currents run with a velocity of about  $\frac{1}{2}$  knot, the flood to the southward and the ebb to the northward. On the eastern side of the passage near Savana Island the velocity increases to about 2 knots.

**ANEGADA** (*H. O. Chart 3904*), the most northern and eastern of the Virgin Group, is included in the British portion and has a population of about 358, whose chief employment is fishing and wrecking; the principal settlement is on the southern side, 6.5 miles from the western end. The island being low, the strength and irregularity of the tides and currents in its immediate neighborhood makes it dangerous to approach at night, unless very certain of the position.

In the daytime, however, with clear weather, the risk is not so great, as Virgin Gorda Peak, 1,370 feet (417.6 m.) high, serves as a beacon to guide mariners clear of all its dangers. Anegada lies within  $1\frac{1}{2}$  miles of the edge of the Virgin Bank, but the soundings are so deep up to it that the lead is scarcely of any use. It is 9 miles in length east and west and from 1 to 2 miles in breadth, almost uniformly about 30 feet (9.1 m.) high and covered with brushwood excepting in a few spots which are cleared for the cultivation of corn and vegetables. A large portion of the interior is cut up by extensive salt-water lagoons.

Fresh water may be obtained by digging wells in the sand, particularly near the beach at the western end of the island, but the inhabitants prefer drinking the rain water caught in the natural cisterns formed in the rocks.

**Horseshoe Reef.**—The island of Anegada is skirted on its outer or northern side by a narrow barrier reef to the distance of from 200 yards at its extreme northern point to  $1\frac{1}{2}$  miles at its eastern end; thence a most dangerous reef extends  $140^\circ$  for 7 miles, upon which many vessels have been lost. This portion is called Horseshoe Reef, and from its southern end detached coral heads and shallow ledges extend  $4\frac{1}{2}$  miles about  $220^\circ$ , where they terminate in Herman Reefs, on which the sea generally breaks.

Two miles  $245^\circ$  from the elbow or easternmost point of Horseshoe Reef is a heap of dead white coral, 3 feet (0.9 m.) out of water, known

as the White Horse;  $2\frac{1}{2}$  miles to the eastward of the elbow there are depths of 34 fathoms (62.2 m.) close within the 100-fathom (182.9 m.) curve, and within a mile of it there are 10 fathoms (18.3 m.). Abreast Herman Reefs the edge of soundings is a little more than a mile distant, which makes them still more dangerous. The southern end of this reef bears  $63^{\circ}$   $5\frac{1}{2}$  miles from Pajaros Point, the eastern end of Virgin Gorda.

There is a detached 5-fathom (9.1 m.) spot about  $1\frac{1}{2}$  miles  $170^{\circ}$  from the summit of Herman Reefs.

In the vicinity of the White Horse, a current setting Northeast at about  $\frac{3}{4}$  knot may be encountered.

**Caution.**—On approaching Virgin Gorda Island from the eastward, care should be observed not to get inside the 100-fathom (182.9 m.) curve with Virgin Peak bearing less than  $254^{\circ}$  until to the westward of Herman Reefs.

**Robert Reef** is a small rocky patch with  $4\frac{1}{2}$  fathoms (8.2 m.) of water on it, lying  $3\frac{1}{2}$  miles within or to the westward of Herman Reefs; from it Pajaros Point bears  $196^{\circ}$   $4\frac{1}{4}$  miles.

$1\frac{1}{4}$  miles to the north-northeastward of this reef there is also a small rocky head with 4 fathoms (7.3 m.) of water on it.

**Hawks Bill Bank** is a small rocky ledge, with depths of from 3 to 5 fathoms (5.5 to 9.1 m.) lying about 2 miles  $338^{\circ}$  from Robert Reef. From the 3-fathom (5.5 m.) head Pajaros Point bears  $186^{\circ}$   $5\frac{3}{4}$  miles. These patches should be avoided when anchoring under the lee of Horseshoe Reef. The water is, however, so clear that the bottom may be seen distinctly in 8 or 9 fathoms (14.4 to 16.5 m.).

**Anchorage.**—The reef fringing the northern side of Anegada terminates at the western end of island at about 300 yards from the shore, but the southern side of the island is foul, with detached coral patches extending off for more than 2 miles.

There is good temporary anchorage off the western end, in from 5 to 6 fathoms (9.1 to 11.0 m.) of water, at about a mile distant. It will not be prudent, however, to remain here during the period of the rollers, which frequently occur from October to May; it will be better at that season to anchor well under the southern side of the island.

The best anchorage will be found in 6 fathoms (11.0 m.), with the western end bearing  $338^{\circ}$   $5\frac{1}{2}$  miles, and East Point  $71^{\circ}$ . Care, however, must be taken after rounding the western end; attention should be paid to the lead, and do not come within the depth of 5 fathoms (9.1 m.)

There is a  $2\frac{1}{2}$ -fathom (4.6 m.) head about  $1\frac{1}{2}$  miles eastward of this anchorage, 5 miles  $251^{\circ}$  from East Point, so in anchoring, the western end of the island should not bear westward of  $330^{\circ}$ .

The bank westward of Anegada is chiefly fine sand, and in light weather vessels may anchor on it in safety, taking care to avoid the rocky banks already described.

The rollers, or ground swell, frequently occur from October to May, and continue sometimes three or four days. In general, they set in after a prevalence of light east or southeast winds. Between Tortola and Guano Island they have been seen to top and break in 9 fathoms, (16.5 m.) and on the southwestern side of Anegada, in  $4\frac{1}{2}$  fathoms, (8.2 m.) anchors are sometimes lifted; it is consequently dangerous for sailing vessels to come too near any part of the northern shores of the Virgin Islands, for the rollers get up suddenly and during their continuance the wind is too light to keep a vessel under command. They appear to have great influence on the bottom in loosening the sand, thus discoloring the water for some miles to the northward of the islands as far as the edge of the bank. In some places near the western end of Anegada, where the bottom is composed of very fine sand, the formation of the banks is frequently changed.

**VIRGIN GORDA** ( $18^{\circ} 30' N.$ ,  $64^{\circ} 24' W.$ , *H. O. Chart 3904*) is easily distinguished on making the land, by its rising gradually to a distant summit in Virgin Peak, 1,370 feet (417.6 m.) high; the outline of the island is extremely irregular, affording good anchorages. Its scattered inhabitants, about 380 in number, are employed in the raising of stock and vegetables, and burning charcoal for the market of St. Thomas.

From Pajaros Point ( $18^{\circ} 31' N.$   $64^{\circ} 19' W.$ ), on the east, to Mountain Point on the west, the northern side of the island is  $5\frac{1}{2}$  miles long, and from the latter point to the southern point of the western shore is 5 miles. The center portion is about 2 miles square and occupied by Virgin Peak. The eastern end of the island is a narrow strip of land composed of irregular rugged hills, terminating at Pajaros Point in a remarkable pinnacle rock 120 feet (36.6 m.) in height. The southern portion is about a mile in breadth, more regular in outline, from 250 to 450 feet (76.2 to 137.2 m.) high, being joined to the northern portion by an isthmus about 200 yards across.

The eastern side of this peninsula has been broken up by some violent action of nature into immense granite blocks, which lie scattered about on the shore. The cays and islets to the southward as far as Round Rock, 2 miles distant, are also composed of the same kind of stone; and the largest, which lies nearly  $\frac{1}{2}$  mile from the southern end of the island, is named Fallen Jerusalem, because of its resemblance to a town in ruins.

Many of these blocks are 60 and 70 feet square; some are merely confined in their places by the weight of others leaning on them; and many, with deep rents and fissures in their sides, appear ready to fall by the slightest shock. In one or two places the sea finds its way through the crevices and forms beautiful natural baths.

It is also a curious circumstance that similar granite blocks are found scattered about on Beef Island, the opposite side of Sir Francis Drake Channel, and nowhere else.

**Water.**—The island of Virgin Gorda is badly watered; there are two small wells at the southern end of the beach in St. Thomas Bay, but the yield is little and indifferent. The supply in Gorda Sound is equally deficient.

**Necker Island** (*H. O. Chart 569*).—On the northern side of Virgin Gorda there are several small, slightly wooded cays and islets, the outer or northernmost of which is Necker Island, lying north-westward about  $2\frac{1}{2}$  miles from Pajaros Point. It is nearly  $\frac{1}{2}$  mile long north and south and about  $\frac{1}{4}$  mile wide, and toward its northern end it is 107 feet (37.6 m.) high; its southeastern side is low and sandy. The northern side is fairly bold and steep-to, there being from 6 to 10 fathoms (11.0 to 18.3 m.) of water within 300 yards, but on the eastern and western sides it is foul and dangerous to the distance of nearly  $\frac{1}{2}$  mile.

**Virgin Sound.**—From the southern side of Necker Island a detached reef extends off nearly  $\frac{1}{4}$  mile, leaving a clear channel named Virgin Sound, with 8 fathoms (14.6 m.) of water in it and with a minimum width of 550 yards between the island reefs and those extending northward of Eustatia. It affords good temporary anchorage in 7 or 8 fathoms (12.8 or 14.6 m.) of water, but care must be taken to avoid the foul ground to the northwestward of the latter island.

**Tidal current.**—In Virgin Sound the flood runs eastward at a rate of  $\frac{1}{2}$  knot and the ebb westward at the same rate.

**The Invisibles** are three small rocky heads with only 4 to 5 feet (1.2 to 1.5 m.) of water on them, and do not always break. They lie about 1,500 yards  $104^\circ$  from the northeastern point of Necker Island; between them and the reef on the eastern side of Necker the depths are from 5 to 8 fathoms (9.1 to 14.6 m.), but on their northern and eastern sides there are depths of 10 fathoms (18.3 m.) at a short distance. They are not easy to see, and therefore care should be exercised when approaching Virgin Sound from the eastward.

**Eustatia**, 650 yards long northeast and southwest, and 172 feet (51.8 m.) high, lies 1,500 yards to the southward of Necker and 900 yards from the nearest part of Virgin Gorda. Its northern side is foul to the distance of 300 yards, and thence a barrier reef extends

on almost a straight line along the shore to Pajaros Point, under the lee of which, in Eustatia Sound, there is a safe anchorage for small vessels.

The entrance is through a small cut in the reef, about  $\frac{1}{2}$  mile eastward of the islet; there are also several other small passages through the reefs, which can be used by boats, but this part of Virgin Gorda should be avoided by strangers, as the ground is foul for some distance outside the cut.

**Prickly Pear**, the largest of the islets off the northern side of Virgin Gorda, is 1 mile in length northwest and southeast, about  $\frac{1}{4}$  mile in breadth, and 237 feet (72.2 m.) high. Its eastern end is not quite  $\frac{1}{4}$  mile from the nearest part of a small peninsula of Virgin Gorda, and in the space between is the Saba Rock, 15 feet (4.6 m.) high.

**Cactus Reef**, extending 300 yards westward of the northwestern end of Prickly Pear, is steep-to on its northern side; the sea breaks heavily on it even with only a slight swell.

**Mosquito Island**, the highest of the islets off the northern shore of Virgin Gorda, lies 1,800 yards westward of Prickly Pear, and is 1,300 yards in length northeast and southwest, about  $\frac{1}{4}$  mile in breadth, and 290 feet (88.4 m.) high. From its northern end small detached rugged rocks extend off 300 yards, the outer end, Mosquito Rock, being 24 feet (7.3 m.) high. Colquhoun Reef, which dries in patches, extends to the southeastward about  $\frac{1}{2}$  mile, and is bold and steep-to outside. On the southern side of Colquhoun Reef and 600 yards from Mosquito Rock, there is a small sandy islet about 2 feet (0.6 m.) high, which is sparsely covered with coarse grass. This reef, with Mosquito Island, forms the northwestern side, and Prickly Pear and Cactus Reef the northern side of Gorda Sound.

**Gorda Sound** is an excellent and capacious harbor,  $1\frac{3}{4}$  miles long, east and west, and 1,500 yards broad, with an average depth of 11 fathoms (20.1 m.) over sand and mud; sheltered from all winds and protected from the rollers. The western portion of Gorda Sound, westward of a line joining the southeastern extremity of Colquhoun Reef and Gnat Point is foul, there being several patches with depths of 2 to 3 fathoms (3.7 to 5.5 m.) on them. In case of necessity Biras Creek, at the southeastern corner of the sound, might be made available for heaving down with very little trouble.

As there is no health officer or other representative of the Government here, vessels before visiting it should obtain pratique at the port of entry, Road Harbor, Tortola.

**Depth.**—Approaching Gorda Sound there is a uniform depth of from 9 to 12 fathoms (16.5 to 21.9 m.). From either side of the entrance (which lies between the ends of Cactus and Colquhoun



Reefs,  $\frac{1}{4}$  mile apart) the depth gradually increases to 6 fathoms (11.0 m.), in a very narrow channel, in a north-northwestern and south-southeastern direction. Between the 5-fathom (9.1 m.) curves the channel is only 45 yards wide.

**Rocks.**—Gorda Rock, situated 1,000 yards,  $36^\circ$ , from Clark Rock, has a least depth of 5 fathoms (9.1 m.).

Creek Shoal, in the entrance to Gun Creek, is of coral sand and has a least depth of  $3\frac{3}{4}$  fathoms (6.9 m.).

Oyster Rock, off the southern shore and 1,200 yards  $15^\circ$  from Vixen Point, is a pinnacle rock with only 2 feet (0.6 m.) of water on it.

**Directions.**—**Steamers** coming from the eastward approach Virgin Gorda Sound by Necker Island Passage, which lies between Virgin Gorda and Herman Reefs. The approach is dangerous at night, so that vessels should time their arrival to daylight.

Bring Virgin Peak to bear  $261^\circ$  and steer for it on that bearing. When within 7 or 8 miles of Pajaros Point, Necker Island will come in sight, which may be steered for when on bearing of  $278^\circ$ , when a vessel will be in the fairway. When Pajaros Point bears  $222^\circ$ , distant  $1\frac{1}{2}$  miles, a course, made good, of  $291^\circ$ , will pass to the eastward of the Invisibles, which will not be seen until close upon them. With the eastern end of Necker Island abeam, head to make good course  $270^\circ$  and continue on this course until Virgin Peak bears  $211^\circ$ , then head for it until Gnat Point bears  $176^\circ$ , and Mosquito Rock bears  $255^\circ$ , when steer for the center of the channel between Cactus and Colquhoun Reefs, which should be entered on a course  $170^\circ$ ; no marks can be given for this channel which, as before mentioned, is only 45 yards wide between the 5-fathom (9.1 m.) curves; but with a favorable light no difficulty should be experienced in passing through it safely.

Coming from the northward it is better to pass to the westward of Anegada. Virgin Peak bearing between  $155^\circ$  and  $133^\circ$  is the best line of approach, and continue until Necker Island is sighted, when it should be headed for until Virgin Peak bears  $211^\circ$ , then continue as outlined above.

**Sailing vessels** can follow the directions for steamers given above, but from the northward, if passing eastward of Anegada, they should on no account attempt to pass close to windward of Horseshoe Reef, which has been the cause of many disasters.

It should be borne in mind that Horseshoe Reef may be distinctly seen, as it breaks in the finest weather, but Herman Reefs only break with a swell or strong breeze, and the White Horse, the bare dry sand to the northward of them, being only 3 feet (0.9 m.) out of water, is scarcely visible at any distance.

Pajaros Point may, if necessary, be rounded at the distance of 400 yards.

**Tidal currents.**—The tidal currents at the entrance of the sound, between the reefs, seldom run more than  $\frac{1}{2}$  knot, and the flood sets toward Prickly Pear Island. Between Mosquito Island and Anguilla Point, south of it, the flood sets to the eastward with a velocity of 1 and  $1\frac{1}{2}$  knots. Between Pajaros Point and Horseshoe Reef it seldom runs more than 1 knot, but its duration varies.

**Western Roads** ( $18^{\circ} 29' N.$ ,  $64^{\circ} 26' W.$ , *H. O. Chart 3904*).—There are two excellent anchorages for vessels of any draft under the western side of Virgin Gorda. The first is situated in the bay between Mountain Point, the northwestern end of the island, and Colison Point, 3 miles southwestward of it, and is partially protected to the northwestward by the Dog Islands. It seldom, however, blows hard to the westward of north, and the only thing to be prepared for is the ground swell in the winter months. At this season it will be better to anchor in about 13 fathoms (23.7 m.) of water, midway between Great Dog and Virgin Gorda, a mile from either, where with good-ground tackle and a long scope of cable there will be nothing to fear, as the rollers are seldom accompanied by much wind.

The southern anchorage, in the same depth, 13 fathoms (23.7 m.), between Colison Point and Fallen Jerusalem,  $2\frac{1}{2}$  miles to the southward of it, is the best for sailing vessels, as, if necessary, they can weigh and run out to the westward with more ease than from the more northern anchorage. The holding ground is good at both places, and, except occasionally, the water is always smooth. There is a small patch of  $4\frac{1}{4}$  fathoms (8.2 m.) lying 800 yards  $270^{\circ}$  from Colison Point. Also Burrow Rock with  $1\frac{1}{2}$  fathoms (2.7 m.) lies 1 mile  $188^{\circ}$  from Colison Point.

**Directions.**—To gain the Western Roads either the northern or southern channels may be taken. The passages between the islets are all bold and free of danger, with the exception of that between Scrub and the Dog Islands, in which lies Tow Rock with  $2\frac{1}{2}$  fathoms (4.6 m.) of water on it, and as it is only 20 yards in extent, it must be carefully avoided. It lies a little more than 1 mile  $285^{\circ}$  from the West Dog. The eastern extremity of Scrub Island bearing  $180^{\circ}$  or  $210^{\circ}$  leads well clear on either side of it. When the West Dog bears  $90^{\circ}$ , the vessel will be well within it, but the best direction is to keep either West Dog or Scrub Island close aboard, as they are bold and steep-to.

**The Great, George, and West Dogs** can not be mistaken, being three small islets, and the nearest to Virgin Gorda; the two eastern are 250 and 270 feet (76.2 and 82.3 m.) high, and the western 150

feet (45.7 m.). About 400 yards westward of the George or Northern Dog is Cockroach Rock.

**Seal Dogs** are a cluster of three much smaller islets, lying close together, about  $1\frac{1}{2}$  miles northeastward of George Dog, with clear channels on both sides. The northernmost islet is only 6 feet (1.8 m.) high, the others 100 and 74 feet (30.5 and 22.6 m.) high.

**Scrub Island**, 450 feet (137.2 m.) high, lies  $1\frac{3}{4}$  miles west-southwestward from the West Dog, and is the easternmost of the numerous small islets and rocks which lie close off the eastern end of Tortola Islands, and which are only separated from each other by intricate cuts from 200 to 600 yards wide.

**Great Camanoe Island**,  $2\frac{1}{2}$  miles in length north and south, with an average breadth of  $\frac{1}{2}$  mile, is nearly broken in two between Lee and Cam Bays. The southern part is 570 feet (173.7 m.) in height while the northern is 530 feet (161.4 m.) high. It is separated by a narrow channel, with about 3 fathoms (5.5 m.) of water from Scrub Island. Marina Cay lies southeastward and Little Camanoe southwestward of the southern end of Great Camanoe, and the whole are connected by a shallow ridge with the northern extremity of Beef Island at the eastern end of Tortola.

**Beef Island**, about 2 miles in length and crescent shaped, is 660 feet (201.2 m.) in height in its eastern part; its southern extremity is the Bluff, a landmark for Road Harbor from the eastward.

**Guano Island** lies 1 mile westward of Great Camanoe, with deep water between. It is about  $1\frac{1}{2}$  miles in extent and 810 feet (246.9 m.) in height, and is about 600 yards from the northeastern extremity of Tortola, with shallow water between.

There is anchorage on the western side of this island, but it should by no means be taken up during the period of rollers, for on such occasions the sea will break here in 8 or 9 fathoms (14.6 to 16.5 m.).

**Southern Channels.**—Between the southern end of Virgin Gorda and the eastern end of St. John, about 14 miles apart, is a range of rugged and most irregularly shaped islets and rocks. Between most of them are deep and navigable passages leading into Sir Francisco Drake Channel, simple and easy of access in the daytime. In the smaller ones, however, a little precaution is necessary in a sailing vessel to guard against the eddy currents and flaws of winds when coming under the lee of the larger islands.

**Round Rock Passage** is the eastern channel, and by far the best for vessels coming from that direction, as it is easily recognized by the remarkable cay of Fallen Jerusalem, a mile to the northward of it. It also offers advantages to sailing vessels, on account of the small islands which form the weather side not obstructing the regular breeze.

The passage lies between Round Rock, 220 feet (67.1 m.) high, and Ginger Island and is about  $\frac{1}{2}$  mile wide, without any danger in it, and both points are bold and steep-to. The tidal current sets through generally with a velocity of 1 knot; the flood southeast, the ebb northwest.

**Ginger Island** ( $18^{\circ} 24' N.$ ,  $64^{\circ} 29' W.$ ; *H. O. Chart 3904*) is 500 feet (152.4 m.) high, and the channel between it and Cooper Island to the westward is 1,500 yards wide. At the southern entrance lies the Carval, a small rock 110 feet (33.5 m.) high, bold and steep-to. It may be passed close on either side. Dry Rocks lie 300 yards off the eastern coast of Cooper Island and in entering, should be left on the port hand. Ginger Island, however, is so lofty that a vessel is likely to be becalmed under it, and if the tidal current is strong against her, she will probably have some difficulty in getting through. In other respects the passage to the westward is as good as Round Rock Passage.

**Cooper Island** is  $1\frac{3}{4}$  miles long in a north and south direction, and at its southern end 530 feet (161.5 m.) high. The passage between it and a small rock awash off the northeastern point of Salt Island is not  $\frac{1}{4}$  mile wide and should never be attempted by a sailing vessel.

**Salt Island Passage.**—Salt Island forms the eastern side of the passage of that name, and at its northern part is 380 feet (115.8 m.) high. The channel between it and Dead Chest, a small islet 200 feet (61.0 m.) high to the westward, is  $1\frac{1}{2}$  miles wide. Blonde Rock, a small head with 2 fathoms (3.7 m.) of water, lies 1,200 yards eastward of Dead Chest, near the fairway; by keeping Salt Island close aboard there is nothing to fear. The sea is generally smooth until well outside, and in light winds the anchor may be dropped, if necessary, between the island and the rock.

The passage between Dead Chest Islet and Peter Island is only about  $\frac{1}{4}$  mile wide, but with a good commanding breeze it may be freely taken from the southward.

**Peter Island—Passage.**—Peter Island, on the western side of Salt Island Passage, forms an elbow; the eastern part, 540 feet (164.6 m.) high, trends north and south for  $1\frac{1}{2}$  miles; the northern, 440 feet (134.1 m.) high, east and west  $2\frac{1}{2}$  miles, which makes the passage between it and Norman Island southwestward of it, although a mile wide, somewhat crooked, so that it is seldom taken by sailing craft. Besides it is obstructed at the southern entrance by Carrot Shoal, a patch with  $1\frac{3}{4}$  fathoms (3.2 m.) of water, lying nearly  $\frac{1}{4}$  mile  $258^{\circ}$  from Carrot Rock, 84 feet (25.6 m.) high, off the southern end of Peter Island. These islands are inhabited by fishermen.

The channel westward of the patch is 1,500 yards wide, with a least depth of 12 fathoms (21.9 m.), and easily navigated by a steamer by keeping Norman Island aboard.

**Flanagan Pass** (*C. S. Chart 905*) is the westernmost of the southern channels, and in the narrowest part, between Indian Rocks and Flanagan Island, it is 1 mile wide.

**Santa Monica Rock** lies in the fairway of the approach; it is small, with  $1\frac{3}{4}$  fathoms (3.2 m.) water on it and 17 fathoms (31.1 m.) close-to, lying 1,500 yards  $210^\circ$  from the western end of Norman Island.

The 940-foot (256.5 m.) hill on Tortola, in range with the highest of the Indian rocks  $3^\circ$ , leads close eastward of it, and Bellevue, the highest hill on the eastern end of Tortola, in range with Indian Rocks.  $16^\circ$ , leads to the westward.

**The Indians** are four remarkable small pinnacle rocks, 50 feet (15.2 m.) high, close together, about 200 yards westward of Pelican Island, which lies  $\frac{1}{2}$  mile from the northwestern point of Norman Island, and is 180 feet (54.9 m.) high.

**Directions.**—Approaching Flanagan Passage from the eastward haul close round the western side of Norman Island, inside the Santa Monica, which may be done without fear at the distance of about 300 yards.

Entering from the westward observe the range leading westward of the Santa Monica Rock.

**The Bight** is a small inlet in Flanagan Passage on the northwestern side of Norman Island, about 1,500 yards deep, east and west, and about  $\frac{1}{4}$  mile broad in the narrowest part, affording excellent anchorage. There is no fresh water on the island and firewood is scarce.

The shores on either side of the bight are steep-to, and when beating in the only danger to be avoided is Ringdove Rock, with 2 fathoms (3.7 m.) of water on it, which lies about 300 yards from the northwestern point of Norman Island. The mark to pass westward of it is Treasure Point, the southern point of the entrance to the Bight, in range with the summit of the western hill bearing  $157^\circ$ . The wind, however, under the lee of the island is so baffling that sailing vessels may have to anchor at the entrance and warp in. Although open to the westward, the island of St. John prevents any sea from setting in, and the holding ground is good.

The anchorage outside in Privateer Bay is likewise safe, with the regular trade wind.

The above range also leads westward of the Indians, and having passed them a vessel may proceed to the westward, or into Sir Francis Drake Channel. There are  $6\frac{3}{4}$  fathoms (12.3 m.) on the bank, lying 1,300 yards  $335^\circ$  from Pelican Island.

**Sir Francis Drake Channel.**—This passage is bounded on the south by the islands between Virgin Gorda and St. John just described, and on the north by Tortola and the small islets to the eastward of it. The narrowest part is about  $2\frac{1}{4}$  miles wide between the bluff which forms the southern end of Beef Island, and the northern point of Cooper Island.

**Depths.**—It is available for most vessels by the several passages described in the preceding pages; Salt Island passage is the best. Eastward of a line drawn from the eastern end of Tortola to Salt Island, the soundings in the channel are regular, from 13 to 14 fathoms (23.8 to 25.6 m.). Westward of this line are numerous coral banks, some of those off Road Harbor, which extend fully one-third across the channel, having as little as 4 fathoms (7.3 m.) over them; the remainder from 5 to 9 fathoms (9.1 to 16.5 m.) with deep water between, the latter being the least depth in the fairways.

**Anchorage.**—There is anchorage anywhere in this channel to the eastward of a line drawn between Buck Island, lying off the southeastern end of Tortola, and Dead Chest, southward of it. The bottom is hard, being a thin bed of sand over coral, and therefore requires a good scope of cable. To the westward of this line there are many rocky knolls.

With strong northeasterly winds an excellent anchorage will be found on the southwestern side of Beef Island, under the lee of the bluff.

**Great Harbor** is a snug little bight, on the northern side of Peter Island, about  $\frac{1}{2}$  mile deep and the same in width, and may be entered without the slightest difficulty at any time; the water is deep close up to the shore, and it has excellent holding ground. The harbor is open to the northwestward, but Tortola protects it in that direction and makes it quite smooth.

**Little Harbor**, a short distance to leeward of Great Harbor, is of much the same character, but smaller. There is no fresh water on Peter Island.

**Tides.**—In Sir Francis Drake Channel there is scarcely any current, except close inshore, where small vessels may gain some advantage from it on the ebb when beating to windward.

**TORTOLA** is the largest and most populous of the British Virgin Islands, and on it is located the seat of the government of these islands. It had a total population in 1921 of 3,987, of whom 35 are white. Tortola is 10 miles in length in an east and west direction, and its greatest breadth about  $3\frac{1}{2}$  miles, with a very irregular outline. Like Virgin Gorda, it is mountainous, Mount Sage rising near the western end to the height of 1,780 feet (542.5 m.); and its rugged hills rise on all sides somewhat abruptly from the shore.

**Hurricanes.**—Tortola is in the West Indian hurricane belt and is occasionally visited by a most severe one. In 1916 the center of one of these storms passed over this island with a loss of 21 lives and practically complete destruction of crops and property. In 1924 Tortola was again visited by a destructive hurricane.

Pending better means of communication, due warning will be given by a public crier in Tortola and also by the blowing of a fog-horn at intervals at Road Town, and all shipping warned. Notification will also be sent to the country districts and to the outlying islands if possible.

Arrangements will be made for the following storm-warning signals to be hoisted from the flag staff at the commissioner's office (Treasury Building), Road Town:

A square red flag with a black center by day, and a red lantern by night, to indicate the probable approach of a hurricane.

A blue flag to indicate an improvement in weather conditions.

**Road Harbor** ( $18^{\circ} 25' N.$ ,  $64^{\circ} 36' W.$ , *H. O. Chart 137*) is on the southeastern side of Tortola, and the only port of entry in the British portion of the Virgin Islands. Being completely exposed to the southeastward, it may be more properly described as a bay, about  $1\frac{1}{4}$  miles deep, 1,500 yards wide, and surrounded by an amphitheater of lofty hills, the spurs of which reach the edge of the shore, Mount Sage and Todman Peak overlooking it on the west and Bellevue on the east, the latter being 1,270 feet (387.1 m.) in height.

**Depths.**—Although a depth of not less than 8 fathoms (16.5 m.) can be carried right up to the anchorage, for a distance of  $1\frac{1}{2}$  miles from the entrance irregular soundings are met with and coral patches with from 3 to 5 fathoms (5.5 to 9.1 m.), on them, with deep water between. In the anchorage itself the bottom is very uneven, the depths varying from 6 to 12 fathoms (11.0 to 21.9 m.). The northern part of the bay shoals rapidly from 5 to 2 fathoms (9.1 to 3.7 m.), and coral reefs extend from 400 to 800 yards off the shore in the northwestern portion.

There are patches of  $4\frac{1}{2}$  to 5 fathoms (7.8 to 9.1 m.) in the eastern part of the anchorage. The head of the harbor is shallow to 800 yards off shore.

Lower Pasea Shoal, Burt Point Shoal, and Upper Pasea Shoal are now entirely or partially covered with mangroves.

**Aspect.**—The town stands on the southwestern shore of the bay and immediately above it a spur of the main ridge reaches 940 feet (286.5 m.) high, where Fort Charlotte formerly stood, but no part of the fort is now seen. On the eastern side, immediately opposite, and scattered along the shore, is the village of Kingston. Conspicuous objects seen on entering the harbor are the flagstaff of the



commissioner's house; a white house, formerly used as an isolation hospital, on Burt Point; the Customhouse, a red-roofed building resembling a church; Roy's House, on the northern shore; and the ruins of Fort George on the northeastern shore.

**Road Harbor Range Lights.**—The front light, fixed red, 15 feet (4.6 m.) above high water, visible 3 miles, is exhibited from a white staff on the customhouse pier.

The rear light, fixed red, 41 feet (12.5 m.) above high water, visible 3 miles, is exhibited on the customhouse flagstaff, 290° from the front light.

These lights in range lead into the inner harbor. (See Light List.)

**Shoals.**—**Denmark Banks**, the eastern extremity of which lies nearly midway between Hog and Slaney Points, have from 2 to 4½ fathoms (3.7 to 8.2 m.) on them. The Bluff, southern extremity of Beef Island, open southward of the outer rock off Nora Hazel Point, 73°, leads south of this shoal.

**Lark Bank**, which lies 400 yards eastward of the dry reef off Burt Point, has 2½ fathoms (4.6 m.) least water on it. The above shoals lie southward of the fairway.

**Scotch Bank**, on the northern side of the fairway, lies between 400 and 700 yards from the eastern shore at Kingston and has 2 fathoms (3.7 m.) over it. The 940-foot (286.5 m.) hill and the hospital on Burt Point in range, 278½°, leads southward of it.

**Buoy.**—The southern side of Scotch Bank is marked by a white conical buoy.

**Harbor Rock**, with 3 fathoms (5.5 m.) of water, is separated from Harbor Spit on the western side of the anchorage by a narrow gut carrying 5½ fathoms (10.1 m.) it lies 700 yards 30° from Burt Point.

**Buoy.**—The southern side of Scotch Bank is marked by a white spherical buoy.

**Anchorage.**—The anchorage is surrounded by the shoals at its entrance and within it, before mentioned, especially on the western side above Burt Point, where the Harbor Spit and Rock extend about ½ mile beyond Wickham Cay.

The entrance is 500 yards wide between Lark and Scotch Banks, and the space just within, abreast Shirley Point, is 800 yards in length and breadth, with not less than 8 to 10 fathoms (14.6 to 18.3 m.) of water. Northward of Harbor Rock there is a space 600 yards in length and breadth, with not less than 4½ to 7 fathoms (8.2 to 12.8 m.). These anchorages are available for large vessels. As before mentioned, the bottom is very uneven.

There is a berth for a small vessel in 9 fathoms (16.5 m.) southward of Harbor Spit, between it and the reef off Burt Point, at about 500 yards, 20°, of the point.

Careening Cove is a small, well-sheltered vein with a depth of about 10 feet (3.0 m.), under the lee of the dry reef off Burt Point.

**Storm signal.**—See page 70.

**Tides.**—The high water full and change in Road Harbor at 8h. 30m.; springs rise  $1\frac{1}{2}$  feet (0.5 m.), and the lowest tides are in April and May.

**Pilots.**—Large vessels are recommended to take a pilot.

**Directions—Steamers.**—Having entered Sir Francis Drake Channel, by one or other of the recommended passages from southward or northward, from abreast the Bluff, the southern extremity of Beef Island, distant about  $\frac{1}{2}$  mile, steer to the westward, on  $258^\circ$ , passing about 700 yards off Marks Rock, until the 940-foot (286.5 m.) hill comes in range with the hospital on Burt Point, bearing  $278\frac{1}{2}^\circ$ ; this mark will lead along the shore in from 6 to 14 fathoms (11.0 to 25.6 m.), passing Hog Point at 300 yards and 250 yards abeam of the white buoy off Scotch Bank. When Roy's House, a prominent landmark on the northern shore bears  $328^\circ$ , head for it. This will lead between Lark and Scotch Banks to the anchorage for heavy-draft vessels between Shirley and Burt Points. When the hospital on Burt Point bears  $257^\circ$ , the vessel will be within the shoals and can pick up an anchorage as convenient in from 8 to 12 fathoms (14.6 to 21.9 m.) with the hospital between that bearing and  $235^\circ$ , at about 200 yards northward of the range line.

Vessels of moderate draft can run straight into the harbor with the coconut trees in range with Todman Peak, which leads over an outer coral patch with  $4\frac{1}{4}$  fathoms (8.2 m.) of water on it. To proceed to the inner anchorage in 8 fathoms (14.6 m.) from a position in which the isolation hospital on Burt Point bears  $256^\circ$  steer for Roy's House bearing  $328^\circ$ , passing northward of Harbor Rock, and anchoring with commissioner's house bearing  $238^\circ$ .

**Sailing vessels** from the northward had better keep to the westward of Anegada, passing through the Scrub or Dog Island channels; from the eastward they may pass either to the northward of Virgin Gorda or through Round Rock Passage, and from the southward through any of the openings to the eastward of Peter Island.

In leaving the harbor, if bound to the northward, sailing vessels will find little difficulty in beating up Sir Francis Drake Channel and so pass out through Scrub Passage, especially if they take the right time of inshore tide, or they may run to leeward through St. John Channel. If proceeding to the southward, they had better take the Flanagan Passage.

**ROAD TOWN** ( $18^\circ 25' N.$ ,  $64^\circ 37' W.$ , *H. O. Chart 137*).—The town contains a population of about 400, and is dilapidated, most of the houses being in ruins.

**Pier.**—There is a small pier near the customhouse with from 4 to 5 feet (1.2 to 1.5 m.) at its outer end.

**Supplies.**—Fresh meat, fish, milk, eggs, vegetables, and bread are readily obtainable. Water is plentiful from wells and rain water collected in tanks and cisterns. Fishing is good in the harbor except during the months August to October.

**Communication.**—The mails are taken between St. Thomas and Tortola, and between Tortola and Virgin Gorda, by a Government sloop, and by private boats as follows: From Tortola to St. Thomas, about four times a week; and from Tortola to Virgin Gorda, about six times a month.

**Sopers Hole** is a snug, deep little basin, a mile in length, east and west, and about  $\frac{1}{4}$  mile in breadth, between Frenchman Cay, 400 feet (121.9 m.) high, and Little Thatch Island on the south, and the western end of Tortola on the northern side. Between Frenchman Cay and Tortola the bottom is muddy and better holding ground than in the hole.

**Depths.**—In the center of the hole there is a depth of 13 fathoms (23.8 m.) which gradually decreases to 6 fathoms (11.0 m.) at 100 yards from the shore, over sandy bottom. In the passage between Little Thatch Island and Frenchman Cay, there is from 6 to 7 fathoms (11.0 to 12.8 m.), and in the approach from the westward from 9 to 16 fathoms (16.5 m. to 29.3 m.)

**Thatch Island Cut** is the passage,  $\frac{1}{4}$  mile wide, between Great Thatch Island and Tortola, and must not be attempted by a sailing vessel from the northward except with a flood tide, as the eddies and stream are very strong.

**Great Thatch Island** is  $1\frac{3}{4}$  miles long, east and west, and rises to a peak 679 feet (207.0 m.) high. Its eastern point, forming the western side of Thatch Island Cut, is bold and steep-to.

**Directions—Steamers.**—There are two passages by which Sopers Hole may be entered from the southward; one between the western end of Tortola and Little Thatch Island and the other between the latter island and Frenchman Cay.

For steamers there are no difficulties in either of the passages, but the western ends of both Tortola and Little Thatch Island must be given a berth of over 200 yards.

**Sailing vessels** taking Thatch Island Cut should approach it on the flood, which will shoot a vessel into it.

If coming from the eastward the passage eastward of Little Thatch Island will be the best, as a vessel will have a leading wind and can luff up closer under the western end of Frenchman Cay, which is steep-to, and shoot into the Hole with either the flood or ebb.

Leaving Sopers Hole, pass out to the northward through Thatch Island Cut, or, if bound into Sir Francis Drake Channel, round the western end of Little Thatch Island at a distance of somewhat over 200 yards and haul to the wind, when, with the flood current on the lee beam, she will be set through between St. John and Tortola with a velocity of 3 or 4 knots. There is no danger on either shore.

A vessel must be prepared to meet the gusts and baffling winds which rush through the valleys of Tortola.

**Tidal currents.**—In the channel between St. John and Tortola the flood runs to the eastward and the ebb to the westward, with a velocity of from 3 to 4 knots.

**Cane Garden Bay** is the only place on the northern side of Tortola that affords anchorage even for small vessels. Across its entrance is a bar with 12 feet (3.7 m.) of water, inside of which there are depths of 3 to 4 fathoms (5.5 to 7.3 m.). In all other parts there is no shelter, even for boats.

**Jost Van Dyke** ( $18^{\circ} 26' N.$ ,  $64^{\circ} 45' W.$ , *C. S. Chart 905*) lies nearly 3 miles northward of the western end of Tortola. It is  $3\frac{1}{3}$  miles long, east and west,  $1\frac{1}{4}$  miles broad, lofty and rugged, bold and steep to, and toward its northwestern point it rises to the height of 1,070 feet (326.1 m.). On the southern side are Great and Little Harbors, the former about  $\frac{1}{2}$  mile deep, with from 2 to 7 fathoms (3.7 to 12.8 m.) of water in it, the latter, more snug, has 8 fathoms (14.6 m.) within the entrance, but they are only fit anchorage for small vessels.

**Little Jost Van Dyke** is a mile in length,  $\frac{1}{2}$  mile in breadth, 370 feet (112.8 m.) high, and is connected with the eastern end of the greater island by a shallow ledge 200 yards wide. Close to its eastern end is Green Cay, 110 feet (33.5 m.) high and 300 yards long; south of the cay there is a small dry rock and shallow water for nearly  $\frac{1}{4}$  mile.

**Sandy Cay** lies south nearly a mile from Green Cay and 1,500 yards from the eastern end of Jost Van Dyke. Its eastern end is 66 feet (20.1 m.) high, but to the westward it terminates in a low sand spit, and both ends are foul to the distance of 200 yards.

The channel between it and Jost Van Dyke is  $\frac{1}{2}$  mile wide, but the Jost Van Dyke shore, which is steep-to, must be kept close aboard. Sandy Cay is about  $2\frac{1}{2}$  miles westward of Cane Garden Bay in Tortola and, with Green Cay, bounds the western side of the channel between.

**Tobago** lies 2 miles westward of Jost Van Dyke, and is 1,500 yards long, north and south,  $\frac{1}{2}$  mile broad, and 538 feet (164.0 m.) high. A small rock awash, and steep-to, lies about 100 yards from the northern point. The southeastern side of the island is fringed with coral to a short distance, but elsewhere the shore is steep-to, close to the cliff. At  $\frac{1}{4}$  mile from the southwestern side is Watson Rock, perpendicular, steep-to, and 89 feet (27.1 m.) high.

**Mercurius Rock** is the only danger in the channel between Jost Van Dyke and Tobago; it is small, bold, and steep-to, and has a depth of 7 feet (2.1 m.). This rock lies  $108^{\circ}$ , 1,500 yards from the northern point of Tobago. Between the rock and the island the

depth is from 7 to 9 fathoms (12.8 to 16.5 m.), and the same depth will be found for 1,300 yards southeastward of it. In running through this channel the Jost Van Dyke shore should be favored.

**Little Tobago** lies about 1 mile southwestward from Tobago; it is nearly  $\frac{1}{2}$  mile in length,  $\frac{1}{4}$  mile in breadth, and 279 feet (85.0 m.) high.

There is a deep channel between these islands, but if used care must be taken to avoid King Rock, which is awash and may be seen  $\frac{1}{2}$  mile off under favorable circumstances. It is bold, steep-to, and is situated within the 10-fathom (18.3 m.) curve which extends 1,500 yards,  $210^\circ$ , from Tobago. It is desirable to pass to the south and westward of King Rock.

**ST. JOHN** (*C. S. Chart 905*), the smallest and least populous of the United States Virgin Islands, is 8 miles long, east and west, and of irregular breadth; has an area of about 20 square miles and a population in 1917 of 959. Its eastern end, for the distance of 3 miles, is formed by a narrow neck of land from a mile to less than  $\frac{1}{2}$  mile across; and from its inner end the coast turns sharply to the southward, forming a deep bight, which terminates at Ram Head, a remarkable bold headland, on which are two hummocks, the highest 300 feet (91.4 m.) above the sea, forming the southern point of the island; thence, across to Mary Point on the northern side, the island is 5 miles broad. The western portion is composed of irregular hills, the highest of which, the Bordeaux Mountain, reaches the height of 1,277 feet (389.2 m.). The spurs from the heights terminate abruptly at all the projecting points, and with the exception of a small spot at Coral Bay nothing is seen but hill and dale.

**Little Cruz Bay** is a cove at the western extremity, but only fit for coasters. There is a village on the shore and a white building called the fort. The Government House for St. John is located on a small peninsula in the Bay and is a prominent landmark. An excellent road leads thence to the northern part of the island and thence to Coral Bay.

**Great Cruz Bay**, at the southwestern end of the island, affords good shelter for small vessels; it is a little more than 300 yards wide at the entrance and about 800 yards in length. From between the two bluffs, at its entrance, the water gradually decreases from 4 to 3 fathoms (7.3 to 5.5 m.) and then suddenly to 2 fathoms (3.7 m.).

**Maria Bluff** is the end of the high point south of Great Cruz Bay and forms the southwestern point of St. John. It is 283 feet (86.3 m.) high.

**Rendezvous Bay**, to the eastward of Buhvun Point, is  $\frac{1}{2}$  mile in extent, with a depth of from 5 to 6 fathoms (9.1 to 11.0 m.), quite free of danger, but open to the southward.

**Ditlef Point** is a bold promontory, forming the eastern side of Rendezvous Bay.

**Fish Bay**, eastward of Ditlef Point, is only 200 yards wide between the reefs at its entrance but nearly 800 yards in length; within the bay the soundings gradually decrease from 4 fathoms (7.3 m.) to the shore.

**Reef Bay**, a little eastward of Fish Bay, may be known by a remarkable white cliff 135 feet (41.1 m.) high which forms the eastern side; on the eastern side it has no good shelter, but there is a good boat harbor within the reef which skirts the shore.

**Great and Little Lameshur Bays** are on the southern side of St. John, between Cabrithorn and White Points; the former affords good shelter for small vessels in about 6 fathoms (11.0 m.) of water under the lee of Cabrithorn Point at about 400 yards offshore, with Ram Head shut in by the point.

**Cabrithorn Point** is a well defined projecting point, faced by high cliffs, back of which the land rises to a height of 995 feet (303.3 m.). From Cabrithorn Point to Ram Head,  $1\frac{1}{4}$  miles east southeastward, there are several small bays. Booby Rock, 35 feet (10.7 m.) high, lies  $114^{\circ}$ , 1,000 yards from Ram Head.

**Ram Head**, the southern point of St. John, is a remarkable bold headland, on which are two heads, the northern and highest being 288 feet (87.8 m.) high. There is generally a heavy sea running off this point.

**CORAL BAY**, at the eastern end of the island, is the name applied to a deep bight. The eastern side is formed by a lofty promontory, which juts out to the southeastward and terminates at Moor Point; thence, to the nearest point of the shore westward, the bay is  $1\frac{1}{4}$  miles wide and open to the southeastward. The shore within this is cut up into three smaller bays, Hurricane Hole, Round Bay, and Coral Harbor.

Nearly midway between Moor Point and Ram Head is Leduck Cay, 600 yards long, 100 yards broad, and 84 feet (25.6 m.) high. Between it and Sabbat Point, to the northwestward, there is a channel 700 yards wide; and to the northeastward, between it and Moor Point, is another, 1 mile broad, the better for entering the bay.

**Eagle Shoal** lies 1,200 yards southward of Leduck Cay and  $\frac{3}{4}$  mile eastward of Ram Head. It consists of three round patches of coral, the easternmost being 40 yards in diameter with a depth on it of only 3 feet (0.9 m.); the western and northwestern patches, each with 2 fathoms (3.7 m.), lie about 100 and 500 yards from it, respectively, the western patch being a little larger than the eastern. Close to and around them the depths are 6 fathoms (11.0 m.) and 7 fathoms (12.8 m.) and 100 yards south there are 13 fathoms (23.8 m.).

There is no town or village here, but the Moravian missionaries have a small establishment at Coral Harbor.

**Depths.**—The average depth in Coral Bay is from 11 to 13 fathoms (20.1 to 23.8 m.), but there are several patches which should be avoided, especially in Round Bay. The channel between Leduck Cay and Sabbat Point carries 10 fathoms (18.3 m.), and that between the same island and Moor Point 13 to 14 fathoms (23.8 to 25.6 m.), with the exception of two coral patches with depths of  $5\frac{1}{4}$  and 8 fathoms (9.6 to 14.6 m.), respectively.

**Hurricane Hole** ( $18^{\circ} 21' N.$ ,  $64^{\circ} 42' W.$ , *H. O. Chart 2086*) is the safest anchorage, for should the wind blow strong in from the southeastward (which, however, seldom happens), a vessel will be partially sheltered. A small vessel might, if necessary, heave down in the bights here. The best berth is in 11 fathoms (20.1 m.) of water, with Turners Point, the eastern point of the Hole, bearing  $126^{\circ}$ , and Coral Harbor eastern point  $256^{\circ}$ . (See view 1, Appendix V.)

**Round Bay.**—The best anchorage is in 13 fathoms (23.8 m.) with Moor Point about 600 yards  $115^{\circ}$ . There are several patches in the bay, which should be avoided, and should the wind come to the southward of east, a vessel should be ready to move.

**Coral Harbor.**—The anchorage here is smooth, with the ordinary winds, but being on a lee shore, and having a narrow entrance, and with depths of 3 fathoms (5.5 m.) or less, it is only available for small, handy vessels.

**Water.**—At the head of Coral Harbor there is a well of excellent water; boats may lay alongside the wharf in smooth water, and a good road enables the casks to be rolled up to it with little labor. Firewood is plentiful, but it is private property.

**Directions.**—In approaching Coral Bay from the westward, from a position  $\frac{1}{2}$  mile south of Ram Head, make good a course of  $70^{\circ}$  until Turner Point is open to the eastward of Leduck Cay and Moor Point bears  $4^{\circ}$ . Then head for Moor Point, making good that course, until  $\frac{3}{8}$  mile to eastward of Leduck Cay when a course made good of  $320^{\circ}$  will lead clear of all dangers until anchorage in Coral Harbor or Hurricane Hole can be head for.

Leaving the bay, a sailing vessel may pass between Sabbat Point and Leduck Cay and to leeward of Eagle Shoal, if advisable. In doing so, however, do not bring Sage Mountain in Tortola open eastward of the western hummock on Leduck Cay until southward of Eagle Shoal.

**Currents.**—The flood and ebb currents set across the mouth of Coral Bay, the flood to the southwestward, the ebb to the northeast-



ward, each with about a velocity of  $\frac{3}{4}$  knot. In the bay there is no current, and the rise of tide scarcely ever exceeds 1 foot (0.3 m.).

Between Red Point and Leinster Bay, along the northern side of St. John, there are several small bays where small vessels may anchor but, being exposed to the rollers, they are not safe. Of these Haul-over Bay is the largest.

**Leinster Bay.**—On the northern shore, southward of Thatch Island Cut, is an indentation about 1,500 yards in length and about  $\frac{1}{4}$  mile in breadth. The western part of Leinster Bay is separated from Francis Bay by a narrow neck of land only 300 yards across, and the shore is here fringed with a narrow coral ledge awash, easily seen. Its eastern part is named Smith Bay, in which is Water Melon Cay; a vessel may anchor under this cay about 200 yards from the shore. This cay is bold and steep-to, and is separated from the island by a channel, 200 yards wide, carrying 2 fathoms (3.7 m.) of water.

**Francis Bay**, formed by Mary Point, is somewhat protected as far round as  $315^\circ$  by Whistling Cay, and is about 1 mile deep and the same in breadth, and affords good anchorage in 9 fathoms (16.5 m.) of water, sand. Between Whistling Cay and the shore southward of it is a bank 800 yards in length and 250 yards in breadth, fronting the bay, with  $3\frac{1}{3}$  to 4 fathoms (6.2 to 7.3 m.) of water on it. The cut between Whistling Cay and Mary Point is clear, but not easily navigated in a sailing craft on account of the baffling winds from the high land.

**Johnson Reef.**—Nearly midway between Whistling Cay and Durløe Cays, which are 2 miles to the westward, is Johnson Reef. It is  $\frac{1}{4}$  mile in length, 200 yards in breadth, lies  $\frac{1}{2}$  mile from the shore, with which it is connected by a sunken ledge, and always breaks. There are depths of  $3\frac{1}{2}$  fathoms (6.4 m.) at 200 yards northward of it, 3 fathoms (5.5 m.) at about the same distance east and west of it, and deeper water beyond.

**Durløe Cays.**—Nearly 2 miles northeastward of Little Cruz Bay, and  $\frac{1}{2}$  mile from Hogsnest Point, is the largest of the three Durløe Cays, 69 feet (21.0 m.) high; the other two, 45 and 18 feet (13.7 and 5.5 m.) high, are about 300 yards and 400 yards northeast and northwest of it.

**PILLSBURY SOUND** (*C. S. Chart 905*) is the name given to the space between St. Thomas and St. John and a chain of small islands, from 200 to 300 feet (61.0 to 91.4 m.) in height. The chain comprises Thatch Cay, Grass, Mingo, Lovango, and Congo Cays. They bound the sound on the northern side, forming an excellent roadstead, about 2 miles in extent east and west and  $1\frac{1}{2}$  miles north and south, quite secure against rollers and all winds except from the

southward, which only blow in the hurricane months. The currents in it, however, attain a velocity of 2 knots, so that if intending to remain any time it will be better to moor to avoid a foul anchor.

**Depths.**—The depths in the sound are somewhat irregular, varying from 7 to 18 fathoms (12.8 to 32.9 m.). All the main passages leading to it are deeper than the mean depth of the sound itself; that from the southward carrying from 13 to 18 (23.8 to 32.9 m.), the Windward Passage 12 to 16 (20.1 to 29.3 m.), the Middle Passage 13 to 15 (23.8 to 27.4 m.), and the Leeward Passage 11 to 14 fathoms (20.1 to 25.6 m.).

**The Two Brothers** are two small barren rocks, 20 feet high (6.1 m.), lying in the middle of the sound. A ledge extends off their northeastern side, deepening to 5 fathoms (9.1 m.) at the distance of 250 yards. A depth of 4 fathoms (7.3 m.) has been reported 1,500 yards 162° from West Brother. A shoal with a least depth of 25 feet (7.6 m.) lies  $\frac{1}{2}$  mile east-southeastward of Cabrita Point.

**Anchorage.**—About 1,500 yards westward of Little Cruz Bay there is anchorage in the southern part of the sound in 11 fathoms (20.1 m.) of water, over sand and mud, with the center of the Two Brothers in range with the western point of Grass Cay, 303°, and Dog Rock open westward of Steven Cay, 183°; also in 9 to 10 fathoms (16.5 to 18.3 m.)  $\frac{1}{2}$  mile northwestward of the Brothers, and elsewhere if desirable.

**Directions—Southern Passage.**—A vessel may approach the anchorages in the sound by the southern passage between Steven Cay and St. John Island, but it can not be recommended to sailing vessels on account of the baffling winds under the high land. The passage westward of the cay is a mile or more in width, with not less than 14 fathoms (25.6 m.), and the eastern end of Grass Cay ahead bearing 348°, leads in the fairway; when Steven Cay bears 87°, keep northeastward for the anchorage. The best mark to run through to the eastward of Stevens Cay is the most western of the Durloe Cays in line with Carval Rock ahead bearing 12°. The reef off Turner Bay and the dry rocks off Steven Cay are bold and steep-to; but care must be taken to guard against being set out of the course by the tidal current that runs with a velocity of 2 knots through the channel, the flood to the southward, the ebb to the northward.

**Northern channels.**—**Windward Passage** lies between the Lovango and Durloe Cays, 600 yards wide. The Durloe Cays within the entrance, and before described, can not be mistaken. On the western side of the channel are Carval Rock, 400 yards off the eastern end of Congo Cay, which lies close to the northward of Lovango Cay, and Blunder Rock awash, 400 yards from the eastern end of Lovango Cay.

Vessels of deep draft may take the passage between Lovango and Durloe Cays. The pilotage is simple, the eye being a sufficient guide, for every danger will be seen.

Sailing vessels, should the wind fall light, may anchor at a moment's warning; under 10 fathoms (18.3 m.) the ground is rocky.

In this channel there is a race, which appears like broken water, with the ebb running against the wind. Through Durloe Cays and between them and Hogsnest Point there are deep and clear passages, but these are not recommended.

There is no navigable passage between Lovango and Mingo Cays nor between Mingo and Grass Cays.

**Middle Passage**, between Grass and Thatch Cays, is about 500 yards wide, and presents no difficulties to steamers, the only danger being a small rock awash, lying 285° nearly 200 yards from the western end of Grass Cay, and is easily seen from aloft.

Sailing vessels generally use this passage in leaving the sound, but it may be entered from the northward on the ebb provided a vessel can make 135°.

**Currents.**—In Middle Passage the flood current sets to the southward with a velocity of about 2 knots at springs, and takes a south-eastward direction inside; the ebb sets in the opposite direction, with the same velocity.

**Leeward Passage**, between Thatch Cays and the northern side of St. Thomas, is 500 yards wide, with depth of not less than 11 fathoms (20.1 m.), but in the western entrance a 3¾-fathom (6.9 m.) patch lies about 1,400 yards off the western extremity of Thatch Island. The flood sets through eastward with a velocity of about 2 knots, and the ebb with the same velocity in the opposite direction.

**ST. THOMAS** (*C. S. Chart 905*), the most important commercially of the Virgin Islands of the United States, is the seat of the insular government. It is 12 miles long east and west, 1 to 3 miles broad, and in its general features very much resembles St. John. A lofty ridge extends its whole length; the most remarkable summit, Signal Hill, nearly in the center of the island, is 1,499 feet (456.9 m.) above the sea, and West Mountain, 1,549 feet (470.9 m.), whence large spurs branch off to the north and south and terminate abruptly on the shore. It is almost surrounded by small islands and cays, in general bold and steep-to, with but very few hidden dangers to guard against.

**The population** of the island is about 10,200.

**Meteorological data.**—The average temperatures at St. Thomas, covering observations for 3 years, range from 78° in January and February to 84° F. in August and September, with a maximum of 91° F. and a minimum of 67° F.

**Eastern end—Islets and rocks.**—Off the eastern extremity of St. Thomas lie the three small islands of Great and Little St. James and Dog Island, the latter having the Dog Rock, 9 feet (2.7 m.) high, close off its eastern extremity; these form the western side of the entrance to Pillsbury Sound described in the preceding pages.

**Dog Island Cut,** between Dog Island and Little St. James, has from 2 to 3 fathoms (3.7 to 5.5 m.) of water, and has a 1½-fathom (2.7 m.) rock in midchannel. This cut is not navigable except by very small craft.

**St. James Cut.**—A depth of 20 feet (6.1 m.) may be carried through this cut between Great and Little St. James, passing on either side of Welk Rock, which lies off the eastern side of Great St. James. The channel is on the Great St. James side, but so circuitous as to be by no means safe. It should only be attempted by small sailing vessels from the eastward, with the wind well aft, and against the ebb and then only in a case of necessity. The eye will be the best guide.

**Beacon.**—A black and white beacon has been erected on the cliffs near the southwestern corner of Little St. James Island.

**Current Hole and Passage** is between Current Hole Point, at the eastern end of St. Thomas, and Great St. James Island, nearly 400 yards distant. The passage is divided nearly in the center by Current Rock, 13 feet (4.0 m.) high, and between it and St. Thomas the depth is only 9 feet (2.7 m.); but on the St. James side a vessel may carry 23 feet (7.0 m.) through a small channel not quite 100 yards in breadth and 200 yards in length. The tidal currents rush through the opening with such violence as to cause a strong race, and gives the name of Current Hole to the small bight between it and Cabrita Point, the eastern extremity of St. Thomas.

**Tidal currents.**—The flood sets through Current Passage to the southward with a velocity of at least 3 knots, and the ebb with equal force to the northward.

**St. James Bay** is formed between the eastern end of St. Thomas and Great St. James Island, and contains excellent and secure anchorage, except in hurricane season, being sheltered from all points but the southwest. The Stragglers, are a reef of dry rocks extending 400 yards from the southwest of St. James Bay. All of these rocks are steep-to, and well above water. The Cow, 10 feet (3.0 m.) high is the western rock of a group of rocks in the southern approach to St. James Bay. Close to the eastward and on the same reef is the Calf, 3 feet (0.9 m.) high.

**Directions.**—Vessels entering St. James Bay from the southward should steer a course to pass midway between the Stragglers and the Cow and anchor as convenient. If necessary, a sailing vessel may run out between the Cow and Calf and Deck Point, in which chan-

nel there are irregular depths of from  $4\frac{1}{2}$  to 9 fathoms (8.2 to 16.5 m.). From northward, through Current Hole and Passage. From a position  $\frac{3}{8}$  mile south of Cabrita Point, make good course  $222^\circ$ . This should head for Current Rock. When about 200 yards distant, haul to the eastward and pass the rock on the starboard hand or to the westward, and enter St. James Bay. Select anchorage as convenient. Sailing vessels using this passage should do so on the ebb with a steady commanding breeze to overcome the force of the current.

**Jersey Bay** between Deck Point, 142 feet (43.3 m.) high, and Patrick Point, 75 feet (22.9 m.) high, is  $1\frac{1}{2}$  miles wide and 1,500 yards deep, Rotto Cay, 300 yards southward of Compass Point, is 33 feet (10.1 m.) high. Coculas Rocks, a group of bare rocks, lies 350 yards eastward of Rotto Cay. Cas Island, in the southern approach, lies  $\frac{1}{4}$  mile northeastward of Patrick Point. Because it is obstructed by numerous small islands, rocks, and mangrove swamps, and because of the nearness of St. James, the use of this bay by moderate-sized vessels is not recommended.

**ST. THOMAS HARBOR APPROACHES**—(*C. S. Chart 905*).—In approaching St. Thomas Harbor, it is customary to use the main ship's channel which is to the eastward of Water Island. There is, however, an entrance to the westward of Water Island through Gregerie Channel, which, while it has plenty of water, is most winding.

**From the Eastward—Frenchman Cap.**—Approaching St. Thomas Harbor from the eastward, two small islands will be observed on the southern side of the island, named Frenchman Cap and Buck Island. Frenchman Cap is the southernmost and lies  $4\frac{1}{3}$  miles  $208^\circ$  from Dog Island, at the eastern extremity of St. Thomas. It is a remarkable islet, 300 yards long, 200 yards broad, and 183 feet (55.8 m.) high, covered with long grass and steep-to. On the northern side there are depths of 6 to 8 fathoms (11.0 to 14.6 m.) at 400 yards from the islet, and on the southern side 24 fathoms (43.9 m.) at 200 yards.

**Buck Island** consists of two islands of irregular shape, with no passage between, is about 1,500 yards in length, 120 feet (36.6 m.) high in the eastern part, partially covered with brushwood, and lying about  $1\frac{3}{4}$  miles  $208^\circ$  from Long Point. It is steep-to on its southern side. (See view 4, Appendix V.)

Off the western end a shallow ledge extends to the distance of 100 yards, and on the northern side the depth is 5 fathoms (9.1 m.) at the same distance. Good landing will be found in the little bay at the southwestern end of the western island by means of a small wharf and boat landing.

**Buck Island Light**, group flashing white 125 feet (38.1 m.) above high water, visible 12 miles, is exhibited from a square white tower on the highest point of the northern part of Buck Island. (See Light List.)

**Dangers.**—**Packet Rock** is a coral shoal about 100 yards in extent, with a depth of 3 feet (0.9 m.), 1,500 yards 253° from Long Point, the southern extremity of St. Thomas. The ranges Long Point—Camelberg Peak (St. John) and Coculus Point—Flag Hill exactly mark this rock. The sea does not always break over it, and it can not be seen until close to. To the south and west it is steep-to; on the eastern side the depth gradually increases to 7 fathoms (12.8 m.) at 150 yards from the rock.

**Buoy.**—**Packet Rock** is marked by a red nun buoy moored on the south side of the rock.

**Caution.**—When abeam and to the northward of Buck Island Light be sure to keep Muhlenfels Light bearing more than 310°.

Small coasting vessels use the range Long Point-Dog Island to keep to northward of **Packet Rock**.

The shore abreast the shoal is clear, with a depth of 6 to 8 fathoms, (11.0 to 14.6 m.) sand and rock, at 300 yards off, extending from Long Point as far west as Coculus Bay, 500 yards south of which there is a small head with 1½ fathoms (2.7 m.) of water, but it is out of the line of travel.

**Green Cay**, 30 feet (9.1 m.) high, lies 200 yards off the eastern point of French Bay, eastern side of the approach to the harbor; rocks above water extend 150 yards southwestward of it.

**The Triangles** lie nearly midway between Green Cay and Muhlenfels Point. They consist of three small rocks, forming a triangle; the eastern rock uncovers 3 feet (0.9 m.) at low water, the northern rock 1 foot (0.3 m.), and the southwestern and outer rock 2 feet (0.6 m.), and this latter is nearly 650 yards from the shore.

A detached coral rock about 50 yards in diameter lies with the two western rocks of the Triangles in range bearing north, distant 300 yards from the outer. It has 2¾ fathoms (5.0 m.) of water on it, and 7 fathoms (12.8 m.) close to, with patches of 5½ fathoms (10.1 m.) at a short distance.

**Buoy.**—The 2¾-fathom (5.0 m.) shoal to the south of the Triangle is marked by "Triangle Bell Buoy No. 2" painted red and moored to southward of the shoal.

**Caution.**—In approaching St. Thomas Harbor be sure to keep the bearing of Contant Mill more than 316°.

**Directions.**—To pass between Buck Island and Packet Rock, the southern extremity of Dog Island in range with Ram Head bearing 88° and making good course 268°, will lead well clear of Packet

Rock when Constant Mill, a stone structure on a hill 377 feet (114.9 m.) high, bears  $318^{\circ}$  change course to head for it and keep it on this bearing until at the harbor entrance.

At night, vessels should pass between Frenchman Cap and Buck Island Light.

**From the southward.**—There are no dangers in the approach from the southward and a vessel can stand straight in, passing about one mile to westward of Buck Island Light until at the harbor entrance.

**From the westward.**—**Dry Rocks** consist of a group of bare rocks and rocks awash; the highest drying 2 feet (0.6 m.). They lie 1,400 yards  $257^{\circ}$  from Saba Island.

**A wreck** is located in 16 fathoms (29.3 m.) about  $1\frac{1}{2}$  miles south of Saba Island and has over it a depth of 8 fathoms (14.6 m.).

**Saba Island**, 202 feet (61.6 m.) high, lies 2 miles southwestward of Red Point. Turtle Dove Cay lies close to the northern Point of Saba.

**Flat Cays**, 32 feet (9.6 m.) high, with rocks just above high water, nearly 400 yards off the southeastern end, lie between Red Point and Saba Island, about 1,500 yards from the latter. The passage between them is quite clear.

**Porpoise Rocks.**—Three small rocks, 3 feet (0.9 m.), 2 feet (0.6 m.), and awash, and connected by a shallow ledge, compose this group, which occupies a space of about  $\frac{1}{4}$  mile northeast and southwest in the southern approach to Gregerie Channel. They are steep-to and lie about 1,300 yards westward from the southwestern end of Water Island, with depths of 8 to 10 fathoms (14.6 to 18.3 m.) in the channel between. A shoal with a least depth of 26 feet (7.9 m.) is located eastward of Porpoise Rocks. It is a coral head about 8 yards in diameter.

**Directions.**—From a position  $1\frac{1}{4}$  miles north of Sail Rock Light make good course  $99^{\circ}$ . This course will lead 1,400 yards to southward of Dry Rocks and well north of the wreck. When 1 mile south-southwestward of the prominent red cliff of Saba Island change to make good course  $80^{\circ}$  for  $3\frac{1}{4}$  miles until Flamingo Point, Water Island, is  $\frac{1}{2}$  mile distant, bearing  $337^{\circ}$ , and Muhlenfels Light bears  $53^{\circ}$ . Then alter course to head for light and maintain it on this bearing, which will lead to harbor entrance.

**ST. THOMAS HARBOR** ( $18^{\circ} 20' N.$ ,  $64^{\circ} 56' W.$ , *C. S. Chart 933*) is the most important harbor of the Virgin Islands, and one of the finest in the Windward Islands. It is situated near the middle of the southern side of St. Thomas about 10 miles eastward from Sail Rock and 7 miles north of Frenchman Cap.

The harbor is a basin about  $\frac{3}{4}$  mile in diameter and is bounded on the east and north by St. Thomas and on the west by Hassel Island. Although of small extent, the harbor is well protected and perfectly safe except during a hurricane.

**Depths.**—At a distance of  $1\frac{1}{2}$  miles from the entrance there is a depth of from 12 to 14 fathoms (21.9 to 25.6 m.), thence it gradually decreases to about  $6\frac{1}{2}$  fathoms (11.9 m.) between Frederik Point and Rupert Rock, except Scorpion Rock which has a least depth of 23 feet (7.0 m.) and Rohde Bank with a least depth of 17 feet (5.2 m.); it is dredged to 36 feet (11.0 m.) in the confined anchorage for large vessels, thence it gradually shoals to the shore. Alongside the West India Dock a depth of 30 feet (9.1 m.) is maintained.

**Aspect.**—The westernmost of three remarkable rounded spurs which branch off to the southward from the main mountain ridge above the town is called French Hill, the highest house on which is 165 feet (50.3 m.) above the sea. The center one, Berg Hill, is crowned by a large square residence 295 feet (89.9 m.) above the sea. On the eastern spur, named Government Hill, 205 feet (62.5 m.) high on the summit of which is a Blackbeard Castle, a remarkable tower 47 feet (14.3 m.) high, and immediately beneath it is Fort Christian and the water battery, which command the harbor. To the eastward of the town Blue Beard Hill rises abruptly from the shore on the summit of which stands a large house by itself, with a tower near it 258 feet (78.6 m.) above the harbor, and overlooking it, on the mountain ridge, is the country residence of Louisehoe. From thence to the southward a small deep valley, at the eastern end of the basin, separates the spurs from the lofty ridge of hills that form the eastern side of the entrance and which terminates abruptly at Muhlenfels Point. The western side of the harbor is formed by Hassel Island on the southern point of which is Cowell's Battery and Signal Station, 267 feet (81.4 m.) high. (See view 2, Appendix V.)

**The entrance** at the narrowest part is 250 yards wide, from whence it spreads out on either side into a basin about 1,500 yards in diameter, and being open to the southward it is at all times convenient to enter or leave with the prevailing trade winds.

**Canal.**—At the northwestern part a canal 13 feet wide and 6 feet (1.8 m.) deep has been cut to create a current of water through the harbor from Gregerie Channel. The cutting of this canal has, it is said, caused great improvement in the sanitary state of the harbor. This canal is marked by two pair of stakes and is a good boat channel.

**Point Knoll** is a coral head with 16 feet (4.9 m.) of water,  $235^{\circ}$  from the lighthouse on Muhlenfels' Point and nearly 150 yards from the nearest part of the point.



**Scorpion Rock** lies in the fairway of the entrance to the harbor, between the lighthouse and Cowell Point. It is a small coral rock, with two or three heads higher than the rest, on which there is a depth of 23 feet (7.0 m.) at low water springs. At about 30 yards on either side of the rock are depths of 25 feet (7.6 m.).

**Buoy.**—A red and black horizontally striped gas buoy showing a flashing white light is moored on northwestern edge of Scorpion Rock. (See Light List.)

**Rohde Bank** lies  $310^{\circ} \frac{1}{4}$  mile from Muhlenfels Point Lighthouse, and consists of three small coral heads lying close to each other with a least depth of 17 feet (5.2 m.) of water on them just within the 5-fathom (9.1 m.) curve fronting the eastern shore.

**Buoy.**—A red second class nun buoy, No. 4, marks the position of the bank.

**Rupert Rock**, 12 feet (3.7 m.) high, whitewashed, lies about  $\frac{1}{2}$  mile northward of the lighthouse, at the narrowest part of the channel into the harbor. At its base are some large bowlders, which extend about 50 yards to the westward. They become covered at high water. On the south the rocks are steep-to at 30 yards off. Between them and Havensight Point there are only from 12 to 15 feet (3.7 to 4.6 m.) of water.

**Rupert Rock Light**, flashing red, 20 feet (6.1 m.) above high water, is shown from a gray post, 16 feet (4.9 m.) high, located on Rupert Rock.

**Frederik Knoll** is a rocky patch on the western side of the harbor entrance, about 100 yards from the shore, and having from 15 to 18 feet (4.6 to 5.5 m.) of water.

**Wreck light.**—Two fixed white lights are exhibited from the eastern ends of the wrecked floating dock which lies sunk, with deck of the superstructure projecting about 3 feet (0.9 m.) out of water, northward of the naval station.

**Muhlenfels Point Light**, flashing white light, 121 feet (36.9 m.) above high water, visible 14 miles, is exhibited from a circular white iron tower on Muhlenfels Point. See view 5, Appendix V.) (See Light List.)

**Bergs Hill Range Lights.**—Front light, fixed red, 197 feet (60.0 m.) above high water, visible 20 miles, is exhibited from a white square lamp house.

Rear light, fixed red, 302 feet (92.0 m.) above high water, visible 20 miles, is exhibited from a white square lamp house, 150 yards  $346^{\circ}$  from the front light.

These lights in range lead into the harbor clear of all dangers.

**Harbor Lights.**—A fixed green light, 14 feet (4.3 m.) above high water, visible 2 miles, is shown from the end of the jetty,

which extends west-southwestward from the water battery of Fort Christian. A fixed red light, 22 feet (6.7 m.) above high water, visible 2 miles, is also shown from the western angle of Kings Wharf. These lights are the leading lights in harbor. (See Light List.)

**Anchorage.**—The best anchorage in the harbor is about 400 yards west of Havensight Point, in 33 feet (10.1 m.), with the highest part of Rupert Rock in range with the lighthouse and with Long Bay fairly open, but pilots usually assign anchorage berths.

Only one vessel of 600-foot length can be anchored in the harbor at one time. There are dock accommodations for several others.

Larger naval vessels usually anchor south of Cowell Point and to the westward of the entrance range.

The quarantine anchorage is outside of Scorpion Rock.

**Mooring buoys.**—There are four mooring buoys on the western side of the harbor.

**Dolphins.**—There are seven dolphins on the northwestern side of the slip leading to the coal wharf.

**Wind and weather.**—St. Thomas, although in the tropical belt, possesses a fine climate. During 9 months of the year, the northeast trades predominate. These winds vary in velocity from a light to moderate breeze and attain their greatest strength normally about 4 o'clock morning and afternoon.

The port is often visited by hurricanes, the wind sometimes reaching a velocity of 150 miles per hour. These storms occur sometimes during July, but more frequently during August and September, and rarely in October.

**Hurricane warnings** are displayed from a staff on Fort Christian and at the signal station, Cowell Battery. For radio storm signal see H. O. Publication 205.

**Tides.**—The mean higher high water interval at St. Thomas is 7h. 30m.; mean range, 0.8 foot (0.2 m.); spring range, 1 foot (0.3 m.). The tides are chiefly diurnal, the interval given above referring to upper transit at north declination and lower transit at south declination of the moon. The mean level of the sea is a foot lower in April and May than at other periods of the year.

**Pilotage** is compulsory for merchant vessels, and every steamer approaching the harbor is met from 1 to 2 miles outside by a pilot. Vessels should keep ranges open to the westward, to avoid getting too close to the Triangles, until the pilot gets on board. The pilots will board the ship at any time during the day or night.

The signal for a pilot is international "S" flag. By day a motor launch and by night a rowboat are used as pilot vessel. The pilot boat flies international "P" by day and shows a blue light by night.

**Directions.**—Having stood up to the entrance, as previously described, when between Triangle Bell Buoy No. 2 and Muhlenfels Light, be sure to be on the entrance range, making good entrance course 346°. As, at its outer end, this range is not very sensitive, care must be observed to stay on it. Continue on this range until past Rupert Rock Light when anchorage may be selected to eastward of range but clear of entrance to West India Co. docks.

**Sailing vessels** leaving the harbor will generally have a leading wind, especially if weighing before 9 a. m. Use the same range to avoid the shoals in going out as in entering; and if the wind should happen to be southward of east, run to leeward of the Scorpion; under these circumstances when, in steering out, the southern part of Water Island comes open of Cowell Point, keep away, taking care to keep to westward of the range Western West India Co. docks (outer end)—Rupert Rock Beacon—until Muhlenfels Point Light bears less than 100°.

**Harbor regulations.**—The following extracts from the Harbor Regulations at St. Thomas may be of value to vessels about to enter the harbor:

Vessels of and above 100 tons gross register must engage a Government pilot in order to enter, leave, or shift berth to the harbor; provided, that public vessels duly commissioned by the United States or foreign government shall not be subject to the foregoing requirements. Vessels not required to engage a Government pilot shall report their arrival and intended departure to the harbor master as soon as practicable. Should a vessel lying outside the harbor send a boat ashore this must be promptly reported to the harbor master.

Vessels shall not anchor off the island of St. Thomas outside the limits of the harbor and the roadstead except in case of necessity. Where a vessel shall have so anchored the vessel's anchorage shall be shifted to the harbor as soon as circumstances shall permit this to be done.

Between sunrise and sunset every vessel, on entering or leaving the harbor, or when under way therein, shall fly its appropriate national flag. Every vessel which shall have entered the harbor after sunset shall fly such flag for at least one hour after sunrise the succeeding morning.

The presence of ammunition, gunpowder, or other explosives on board any boat or vessels entering the harbor shall be promptly reported to the harbor master. None of such explosives shall be placed on board any boat or vessel in the harbor without prior permission of the harbor master.

It is prohibited to throw anything overboard from any boat or vessel, or to pump overboard therefrom any fuel oil within the harbor limits. Ballast, ashes, and refuse shall be conveyed to such place as the harbor master may designate for dumping.

**Quarantine regulations.**—Vessels subject to quarantine inspection are:

(a) All vessels from foreign ports, except the British Virgin Islands.

(b) All vessels from domestic ports against which quarantine restrictions have been declared.

(c) All vessels having sickness on board.

Vessels subject to quarantine inspection shall be considered in quarantine, and on entering the port shall fly the yellow flag until released by the quarantine officer. Vessels held in quarantine shall fly the yellow flag from sunrise to sunset. At night a red light shall be shown at the foremast head. No persons except the quarantine officer, his employees, customs officers and pilots, and public officials specially authorized so to do by the governor shall be permitted to board vessels subject to quarantine inspection.

**ST. THOMAS** ( $18^{\circ} 20' N.$ ,  $64^{\circ} 56' W.$ , *C. S. Chart 933*).—The city, formerly called Charlotte Amalie, the most important city and capital of the United States Virgin Islands, lies on the northern shore of St. Thomas Harbor, on three low hills of the island ridge. There is one main street which is parallel to the water front, and on which are located practically all the business activities of the town.

The population of the city is 8,826.

**Wharves.**—There are two wharves in the harbor—one, the West India Co. Dock on the eastern side of the harbor, for the use of merchant vessels, is 750 yards long and has a depth of 30 feet (9.1 m.) for 125 yards off of it; the other, the Naval Station wharf, is primarily for the use of naval vessels and has a depth of 22 feet (6.7 m.) alongside.

The public boat landing is at King's Wharf where there is minimum depth of 4 feet (1.2 m.).

At the West India dock, cargo must be landed on the dock by ship's equipment where it is expeditiously handled by laborers. The coaling crane could be use to handle very heavy items. There are two long covered sheds on the dock.

The naval station has no equipment for unloading, but cargo landed on dock is handled rapidly.

A small number of lighters are available for unloading larger vessels anchored in harbor.

**Repairs.**—Average repairs can be made by the various engineering companies in St. Thomas. These repairs include welding, shipfitting, joiner and machine work.

**Supplies.**—Engineer and ship supplies may be purchased in limited quantities.

Fresh provisions are scarce and prices are high.

About 6,000 to 10,000 tons Pocahontas coal is available. Ships are coaled alongside the West India Co. wharf; the maximum rate of delivery being 750 tons an hour. Fuel oil is obtainable at either the West India Co. or naval station wharves. Delivery is made at a maximum rate of 300 tons an hour. There are storage tanks available for 16,000 tons. Deisel oil is available in quantities up to 30,000 barrels.

Fresh water in very limited quantities may be obtained at the West India wharf.

**Communications.**—There is cable communication with all parts of the world. St. Thomas is a port of call of the Furness Bermuda Line and the Columbian Line. There is weekly communication by sailing vessel with neighboring islands.

**Radio.**—A United States naval radio station (call letter N B B) at St. Thomas, will accept commercial radio.

**The sanitary conditions of the town are good.** The Government quarantine station is maintained at Mulhenfels Point.

**Hospitals.**—There are two hospitals, the naval hospital and the municipal hospital, where men from merchant ships may be treated.

**Gregerie Channel**, immediately westward of St. Thomas Harbor, is formed by Water Island to the south and St. Thomas on the north, making a complete elbow. East Gregerie Channel, the eastern entrance, is free from danger. At its entrance, between Cowell and Sprat Point, it is  $\frac{1}{2}$  mile wide, and at the elbow or northward end, between Careen Hill and Banana Point,  $\frac{1}{4}$  mile wide.

West Gregerie Channel, the southwestern arm, is about the same length and over  $\frac{1}{4}$  mile wide. At the head or elbow it opens out into a basin  $\frac{1}{2}$  mile in diameter, well sheltered.

**Depths.**—East Gregerie Channel carries from 6 to 8 fathoms (11.0 to 14.6 m.) and the West Gregerie Channel from 6 to 9 fathoms (11.0 to 16.5 m.). At the junction of the two, northward of Water Island, there is a bar with from  $4\frac{1}{2}$  to  $5\frac{1}{2}$  fathoms (8.2 to 10.1 m.).

**Dangers.**—**Gregerie Bank** is in midchannel, 475 yards northward of Sandy Point. It consists of a coral sand shoal about 80 yards long and 40 yards wide, with a least depth of 13 feet (4.0 m.). Cowell Point, open of Banana Point, bearing  $125^\circ$  true, leads northward of it.

**Sandy Point Rock** is an elongated shoal with a depth of 1 foot (0.3 m.) at its northeastern end and 3 feet (0.9 m.) at its southwestern end, lying near the end of a sandy shoal making 250 yards off from Sandy Point. The distance between it and Gregerie Bank is 250 yards. Between Sandy Point Rock and Sandy Point there is a rocky shoal with a least depth of 1 foot (0.3 m.). A 12-foot (3.7 m.) shoal lies 150 yards westward of Sandy Point Rock.

**Buoy.**—A red nun buoy is moored in  $2\frac{1}{2}$  fathoms (4.6 m.) of water on the northeastern side of Gregerie Bank.

**Telegraph cables.**—Three telegraph cables are laid through West Gregerie Channel, the landing place and cable house being in the bay westward of Careen Hill. There is thus little room for any but small vessels to anchor in this channel.

**Tides.**—The flood in Gregerie Channel sets through to the eastward with a velocity of about  $\frac{1}{2}$  knot at springs; the ebb with the same force in the opposite direction.

**Water Island**,  $1\frac{1}{2}$  miles long, 294 feet (89.6 m.) high, is of irregular outline, indented by several small bays and covered by

small trees and dense underbrush. Flamingo Point, the southern point of the island, consists of brown rocky cliffs, 100 feet (30.5 m.) high, upon which the sea continually breaks.

**Water Island Anchorage.**—There is excellent anchorage under the western side of Water Island for vessels of deep draft. If intending to anchor here, pass on either side of Porpoise Rocks and come to in 9 fathoms (16.5 m.) of water, with the town of St. Thomas open to the northward of the island and the southern extremity of the island bearing 140°.

**Directions—Gregerie Channel.**—To enter East Gregerie Channel when off the middle of entrance, make good course 332°, until Regis Point is open to northward of Banana Point, then make good course 295°, which should head for the Nisky Moravian Mission, with Cowell Battery nearly astern, when Bluebeard's Castle begins to open northward of Careen Hill, swing sharply to port and steady with the eastern (lower) summit of Hay Piece Hill bearing 239° and make good that course, heading to anchorage in Little Krum Bay.

To enter West Channel, when 500 yards 137° from Drift Point make good a course of 47° until Gambo Kola Hill is in range with southern tangent of Regis Point, then make good course 26°, which should put range Providence Point—Drift Point astern, and continue until Little Krum Bay opens, when course to anchorage can be steered.

**Anchorage.**—Anchorage will be found anywhere in Gregerie Channel clear of the shoals. The safest and most convenient spot is in the elbow, for a vessel will there be more sheltered from the swell which rolls in from the eastward, besides being clear of the telegraph cables. A good berth will be found to the northward of Banana Point.

**Krum Bay** is an inlet lying between two lofty hills at the western side of the entrance to West Gregerie Channel. It is about 800 yards in length and 150 yards wide in its narrowest part, with a vein of deep water in the center shallowing from 7 fathoms to 3 fathoms (12.8 to 5.5 m.). On the western shore is a cable station and wharf.

**Little Krum Bay**, to northward of Hay Piece Hill, is 350 yards deep and 400 yards wide, with depths of 21 feet (6.4 m.) to within 150 yards of the western shore.

**Coast.—Mosquito Bay** (*C. S. Chart 905*), close westward of Great Krum Bay, is about  $\frac{1}{2}$  mile wide between Mosquito and Red Points,  $\frac{1}{2}$  mile in length, and open to the southward. Off Red Point a rocky ledge extends 600 yards southward; its extremity is Red Point Shoal, with 2 feet (0.6 m.) of water and steep-to. About

800 yards southwestward of Red Point is a depth of 23 feet (7.0 m.). Within the bay the depth from 5 fathoms (9.1 m.) gradually decreases toward the shore; the bay is used only by small vessels.

**Southwest Road**, between Flat Cays and Perseverance Bay, affords an excellent anchorage, with the wind as far to the southward as east-southeast.

There is a shoal head of 4 fathoms (7.3 m.) lying  $246^{\circ}$ , 1,000 yards from Red Point, within Red Point Shoal.

**Directions.**—A sailing vessel should enter from the eastward, keeping fairly close to Water Island until within Porpoise Rocks, should steer between Flat Cays and Red Point Shoal; to avoid the latter keep Flag Hill Peak (on the eastern side of the harbor of St. Thomas) open to the southward of Mosquito Bay Point until the southeastern points of Flat and Turtle Dove Cays are in range, then haul up to the northwestward, and anchor as convenient.

**Perseverance Bay** is the head of Southwest Road, and has depths of 13 fathoms (23.8 m.) at 800 yards from the shore.

A small mountain stream empties itself into the sea at the first little beach in Perseverance Bay, westward of Black Point. It is, however, private property, and a small remuneration is expected for its use.

**The coast** from Perseverance Bay to the western end of St. Thomas is quite clear, with deep water close to the rocks.

**Tides.**—Inshore there is scarcely any current, but between Flat Cays and Saba Island the flood during springs runs to the east-southeast with a velocity of about 1 knot and the ebb in the opposite direction with the same velocity.

**Savana Island** lies 2 miles west-southwest from the western end of St. Thomas. It is nearly a mile in length,  $\frac{1}{2}$  mile in breadth, and the highest part is 269 feet (82.0 m.) above the sea. It is used for breeding goats. On its western side it is steep-to, having 16 fathoms (29.3 m.) 200 yards from the rocks.

**Rocks.**—Some detached dry rocks extend nearly 200 yards from its southern point, with 11 fathoms (20.1 m.) close to their outer edge. There are also some rocks 8 or 10 feet (2.4 to 3.0 m.) high and steep-to on a sunken ledge which extends about 700 yards off its northeastern point, and there is a sunken rock close to its northern point.

**Shoals.**—There is a depth of 26 feet (7.9 m.) south of the southeastern point of Savana Island and a depth of 34 feet (10.4 m.) off the northeastern side of the island.

**Kalkum Cay**, in the middle of Savana Island passage, is a narrow inlet 300 yards long, from 20 to 30 yards broad, 73 feet (22.3 m.) high, and surrounded by deep water, except at the southern end,

where there is a depth of 3 fathoms (5.5 m.), but nearly close-to. About  $\frac{1}{2}$  mile southeastward of the cay is Salt Water Money Rock, 8 feet (2.4 m.) high, also steep-to, with a clear channel between.

Nearly halfway across the passage between the northern end of Savana Island and the western end of Salt Cay there is a coral patch with  $3\frac{3}{4}$  fathoms (6.9 m.) of water on it.

**Directions.**—In navigating the above channels caution is necessary to guard against the tidal current, which in the Savana Passage runs with a velocity of 3 knots and in the others about 1 knot. Sailing vessels beating up against the ebb current should stand well to the southward of Savana Island, so as to avoid the strength of the inshore tide.

**West and Salt Cays** ( $18^{\circ} 21' N.$ ,  $65^{\circ} 03' W.$ ) are separated from the western end of St. Thomas by a boat channel only. They are each about  $\frac{1}{2}$  mile long in a northwest and southeast direction and lie close together. Salt Cay, the outer one, is 242 feet (73.7 m.) high, while West Cay is 121 feet (36.9 m.) high. Both are bold and steep-to, except that close southward of Salt Cay is a shoal with depth of  $5\frac{1}{4}$  fathoms (9.6 m.).

**Dutchmans Cap**, nearly a mile to the northward of Salt Cay, is a remarkable small rocky islet, rising abruptly from the sea to a peak 278 feet (84.7 m.) high, with deep water close around. Off its southwestern side there is a small rock 2 feet (0.6 m.) high. Between it and Salt Cay the soundings are from 13 to 19 fathoms (23.8 to 34.7 m.).

**Cockroach Islet** is of irregular shape, with a flattish summit, and perpendicular cliffs 151 feet (46.0 m.) high, situated  $1\frac{1}{4}$  miles northward of Dutchmans Cap. The islet is bold and steep-to, except there is a shoal of 5 fathoms (9.1 m.) 400 yards eastward of Cockroach Islet. With this exception the passage between is free of danger.

**Cricket Rock** lies  $66^{\circ} \frac{1}{2}$  mile from Cockroach Islet, and is the most northern islet of the group. It is 46 feet (14.0 m.) high, bold and steep-to, except for a  $2\frac{3}{4}$ -fathom (5.0 m.) shoal, 300 yards south of Cricket Shoal. With this exception passage between the two islets is clear.

**Sta. Maria Bay**, nearly a mile wide between Vlucks and Stumpy Points, about 2 miles eastward of the western extremity of St. Thomas, has depths of 4 to 7 fathoms (7.3 to 12.8 m.); it apparently affords fair shelter, but is seldom visited, being exposed to the rollers.

**Brass Islands** are two small islets close off the northern side of St. Thomas and about 4 miles from its western extremity. They are each about 1.500 yards long in a northwest and southeast direction and



700 yards broad; the Inner Brass is 256 feet (78.0 m.) and the Outer Brass 412 feet (125.6 m.) high. Between the inner islet and St. Thomas there is a  $3\frac{3}{4}$ -fathom (6.9 m.) channel, 400 yards wide, and between the two islets there is one of 7 fathoms (12.8 m.), 600 yards wide, but they are only suitable for coasters. There is a depth of 16 feet (4.9 m.) about 330 yards west of the northern extremity of Outer Brass Islet. The flood current sets between them to the southwestward with a velocity of about 1 knot, but the ebb is scarcely perceptible. Under the Inner Brass there is secure and well-sheltered anchorage for coasters in 6 or 7 fathoms (11.0 to 12.8 m.) of water, at about  $\frac{1}{2}$  mile from the shore, with the northern end of the islet bearing  $87^\circ$ .

**Lizard Rock** is a small rugged islet 15 feet (4.8 m.) high, and steep-to on all sides; it lies about 1,500 yards westward of the Inner Brass Island.

**Ornen Rock**, with 6 feet (1.8 m.) of water on it, lies 1 mile eastward of Inner Brass and  $\frac{1}{2}$  mile from Picara Point.

**Caution.**—Dutchman's Cap kept open between the two Brass Islands, leads to the northward of it, and Picara Point in range with Southern Point Hans Lollik Island leads south of it.

**Magens Bay (Great North Side Bay)** (*C. S. Chart 905*) is the only bight on the northern side of St. Thomas that is of any importance. It is  $1\frac{3}{4}$  miles in length and  $\frac{1}{2}$  mile wide, and its eastern side is formed by a long, narrow tongue of land, which terminates to the northwestward at Picara Point, nearly midway between Hans Lollik and the Brass Islands. Being, however, open to the northwestward, and consequently exposed to the rollers, it is safe for small vessels only, and they will find good anchorage anywhere under the weather shore. In entering, care must be taken to avoid Ornen Rock.

The depth in the bay varies from 5 to 12 fathoms (9.1 to 21.9 m.), but in the southern portion there is a bank of  $1\frac{1}{2}$  fathoms (2.7 m.) extending  $\frac{1}{2}$  mile from the shore, surrounded by depths of 2 to 3 fathoms (3.7 to 5.5 m.).

**Shoal.**—A shoal with a least depth of 23 feet (7.0 m.) has been found 600 yards eastward from Mandel Point.

**Hans Lollik and Little Hans Lollik.**—Hans Lollik is a bold rocky islet, 713 feet (217.3 m.) high,  $1\frac{1}{4}$  miles in length, north and south, nearly 1,500 yards broad, and lies  $1\frac{3}{4}$  miles northeastward of Picara Point and  $3\frac{1}{2}$  miles southwestward of Little Tobago. At 400 yards to the northward of it, and connected by a coral ledge nearly dry, which also skirts the eastern side of the island, is Little Hans Lollik,  $\frac{1}{2}$  mile long and 217 feet (66.1 m.) high, and 200 yards northward of it is another low, rocky islet with a sunken rock close off its northern side.

These islets are bold and steep-to on their western side, but to the southward is Hans Lollik Rock, which is awash, about 200 yards in diameter, and steep-to on its southern side. It is situated 700 yards  $128^{\circ}$  from the southern point of Hans Lollik, with a sunken ridge joining it to the island. Pelican Cay, 20 feet (6.0 m.), lies just northward of Little Hans Lollik.

**Directions.**—With the exception of the dangers above mentioned, the channels on either side of Hans Lollik are clear. To avoid Hans Lollik Rock keep Shark Islet, 32 feet (9.6 m.) high near the shore at the east end of St. Thomas, open of the west point of Thatch Cay. Sailing vessels beating to windward should do so on the flood.

**ST. CROIX ISLAND** (*C. S. Chart 905*) is 19 miles long in an east and west direction, but of irregular breadth, having an area of 84 square miles. The southern side is nearly straight and generally low, particularly toward the western end.

Near the center of the northern shore, at the head of a deep bight, is the town of Christiansted and near the center of the western shore is Frederiksted. From the town to the southern shore of the island the distance is about  $2\frac{1}{2}$  miles across, and from thence the breadth gradually decreases to the eastward and terminates in a bluff point, with a sugar-loaf elevation of moderate height just within it. The western portion from the bight preserves a general breadth of 5 miles, and becomes more elevated on the northern side. Mount Eagle, the loftiest summit in the island,  $3\frac{1}{2}$  miles eastward of Ham Bluff, at the northwestern extremity of the island, is 1,165 feet (355.1 m.) high. Southward of the mountains, St. Croix is composed of broad fertile plains with numerous small rivulets which empty into the sea, chiefly on the southern shore, but most of them disappear in the dry season, and it is consequently badly watered at that period, and the water obtained is unwholesome until allowed some time to purify. The island is scantily wooded, but highly cultivated, and its roads are excellent. The population of the island in 1917 was 15,467.

**Winds.**—There is no regular land breeze at St. Croix, but when the trade wind is light during the day it generally falls calm in the night. From June to September, when the trade wind is generally light, occasionally strong winds from the southwestward blow across the island, with much rain. Northers, with the accompanying heavy ground swell, do not appear to reach this island. The months of August and September, rarely in July and October, are the hurricane season during which time the island is occasionally visited by destructive storms.

**Tides and currents.**—The high-water interval is 7h. 30m.

No perceptible tidal current has been observed at St. Croix, but a rise and fall takes place of from 4 to 8 inches (0.1 to 0.2 m.) accord-

ing to the strength of the wind, which will sometimes raise it to 18 inches (0.5 m.). Between this island and St. Thomas there is usually a slight westerly current.

**Southern coast—Reefs.**—The southern coast of St. Croix is bordered by a dangerous broken coral reef, which extends from the eastern end to a position nearly abreast Long Point, 4 miles from the southwestern point of the island, where it terminates at Southwest Shoal; this shoal has only 1 fathom (1.8 m.) water on it and is situated nearly  $1\frac{1}{4}$  mile from Long Point bearing  $154^{\circ}$ . The most dangerous part of the coral reef is between Long Point and Vagthus Point, 7 miles to the eastward, where it runs along shore more than  $1\frac{1}{2}$  miles off. It generally breaks, and as several shallow patches exist outside, it should be cautiously approached. The 10-fathom (18.3 m.) curve is from about  $\frac{1}{2}$  to  $1\frac{1}{2}$  miles southward of the outer part of the reef, and the edge of the bank is very abrupt.

**Small-craft anchorages.**—There are several cuts through the reef capable of admitting small coasters into tolerable anchorage within. One of the best is off the entrance of Krause Lagoon. At Great Point Bay there is a narrow cut leading into safe anchorage for vessel of 10-feet (3.0 m.) draft.

**Southwest Point—Reef.**—The southwestern extremity of the island projects about  $1\frac{1}{4}$  miles in that direction, and from it a coral reef extends southward, with only 3 fathoms (5.6 m.) of water at the distance of about 1,500 yards. The shallow water continues off its southeastern side and the shore eastward round Long Point. The 5-fathom (9.1 m.) curve passes about  $1\frac{3}{4}$  miles from the latter, and nearly 1 mile southward of Southwest Point, but on its western side it is only 200 yards off. The edge of the bank of soundings lies nearly 3 miles southwest of Southwest Point, and terminates abruptly; within it is a narrow coral ledge of 7 to 9 fathoms (12.8 to 16.5 m.).

In the offing between Southwest and Long Points temporary anchorage will be found in 7 fathoms (12.8 m.) of water, in case of necessity, and for small vessels farther in at about 1 mile from the shore in 4 fathoms (7.3 m.).

**Caution** is necessary in approaching Southwest Point. The point fringed by shoals, is low and backed by high land some 3 or 4 miles distant and may cause the mariner to misjudge his distance from the shore, especially at night. Several wrecks have occurred about here, it is presumed, from this cause.

The Argentine transport *Chaco* grounded on a shoal of  $3\frac{1}{2}$  fathoms (6.4 m.) in 1918, which was reported to lie  $157^{\circ}$  about 2 miles from Southwest Point, but the exact position of it is doubtful.

**Western Coast.**—The west coast of St. Croix Island forms an open bay about 4 miles in extent. From Sandy Point the coast

trends north-northeastward for  $2\frac{1}{4}$  miles to Frederiksted. It is mostly a sand beach, back of which the land slopes gently upward and is covered by grass and bushes. The beach is steep to, the 5-fathom (9.1 m.) curve lying 200 yards off Sandy Point and about the same distance along the coast to a little southward of Frederiksted, where it trends slightly off shore.

**Frederiksted Road** ( $17^{\circ} 43' N.$ ,  $64^{\circ} 53' W.$ ; *H. O. Chart 1409*),  $2\frac{1}{4}$  miles northward of Sandy Point and  $3\frac{1}{2}$  miles southward of Ham Bluff, is on an open roadstead, a port of call, and is the chief commercial town of the island.

**Depths.**—The 100-fathom (182.9 m.) curve is 1,200 yards off the shore; thence the depth shoals rapidly; the 20-fathom (36.6 m.) curve being 900 yards, the 10-fathom (18.3 m.) curve being 700 yards, and the 5-fathom (9.1 m.) curve being 400 yards from the shore.

**Frederiksted Harbor Range Lights.**—Front light, fixed red, is shown from a white post on the dock.

Rear light, fixed red, 24 feet (7.3 m.) above high water, is shown from the porch of the customhouse.

These lights are in range on course  $90^{\circ}$ .

**Anchorage.**—There is good anchorage off the town in from 6 to 7 fathoms (11.0 to 12.8 m.) with the fort bearing  $100^{\circ}$  and Sandy Point  $200^{\circ}$ , or on the Frederiksted Harbor range in the same depth.

There is a stone pier, under the harbor lights, with 8 feet (2.4 m.) alongside.

**The winds and weather** are similar to the rest of St. Croix, as noted on page 95.

**Directions.**—The edge of the bank is not more than  $\frac{1}{2}$  mile from the shore; shallow water extends  $\frac{1}{4}$  mile from the northern point of the bay and, as already remarked, a mile southward of Southwest Point. In rounding the latter a vessel should not shoal the water to less than 15 fathoms (27.4 m.).

**FREDERIKSTED**, the chief commercial town of St. Croix, viewed from the sea, resembles a Spanish town. It has a population of 3,144, of whom 96 per cent are colored.

**Wharves.**—All cargo and passengers are unloaded and loaded by means of lighters landing at the stone pier at the customhouse. On the northern wharf there is a 10-ton crane.

**Supplies.**—Ships' supplies are very scarce. Only small stores are obtainable. Engineers' supplies are not obtainable.

**Communications.**—There is steamship communication with New York, South American ports, and ports of the West Indies. There is cable communication with all parts of the world.

**Radio.**—There is a United States naval radio station (call letters N N I), from which hurricane warnings are broadcasted. This station will accept commercial traffic. See International List of Radio Stations and H. N. No. 205.

**Hospital.**—There is a municipal hospital. Seamen are admitted.

**West coast.**—From Frederiksted the coast trends northward for  $2\frac{1}{2}$  miles and curves eastward for 1 mile to Ham Bluff. The hills gradually work westward meeting the shore near Butler Bay. Ham

Bay is a small bight  $\frac{1}{2}$  mile westward of Ham Bluff. It is open to the northeast and is shoal.

**North coast.**—The northwestern end of the island is considerably elevated, and formed chiefly of bold cliffs, steep-to. Between Ham Bluff, which is very remarkable, and Barons Bluff,  $5\frac{1}{2}$  miles eastward of it, the 100-fathom (182.9 m.) curve is not more than  $\frac{1}{2}$  mile offshore.

**Ham Bluff Light**, group flashing white, 394 feet (120.1 m.), above high water, visible 27 miles, is exhibited from a white cylindrical tower situated on Ham Bluff. (See Light List.)

**Salt River and Salt River Point.**—Between Barons Bluff and Salt River Point, but nearer the latter, is a narrow cut in the reef, leading to an inlet into which Salt River discharges; it has a depth of about 2 fathoms (3.7 m.), but is only suitable for boats.

Salt River Point is rather low and forms the northern extremity of the island and is the northwestern point of the bight in which Christiansted is situated.

**White Horse.**—About 400 yards northward of Salt River Point lies the White Horse, a rock which breaks; and between it and the shore there is a boat channel with a depth of 2 fathoms (3.7 m.).

From Salt River Point the shore turns sharply to the southeastward for 3 miles to the harbor of Christiansted.

**CHRISTIANSTED HARBOR** ( $17^{\circ} 46' N.$ ,  $64^{\circ} 42' W.$ , *H. O. Charts 1058 and 2090*) is on the north coast of St. Croix, 10 miles east of Ham Bluff and  $7\frac{3}{4}$  miles west of East Point. The anchorage is in a basin protected from the sea by Long Reef and Scotch Bank. A tortuous channel leads in behind the reef to the anchorage. The greater portion of the harbor is shoal.

**Depths.**—This anchorage is sheltered on the north by Long Reef, which extends along shore in front of the town at a distance of about 1,500 yards, and on the northeast by Scotch Bank, but the greater portion of the harbor thus formed is shallow. The remainder, though the water is not less than 21 feet (6.4 m.) in the fairway, is only suitable for a few vessels of about 17 feet (5.2 m.) draft.

**Aspect.**—The high hills behind the town show up prominently from the sea. Central Sugar Factory chimney,  $\frac{3}{4}$  mile northwestward of the town, is a large stack and very prominent. Mount Welcome, 125 feet (38.1 m.), heavily wooded on its sides, has a stone tower and the ruins of a sugar mill at the top. See views on H. O. Chart 2090.

**Dangers.**—**Long Reef** is a very narrow strip of reef about 2 miles in length, and nearly awash in places. Its eastern end (Great Middle Ground) with depth of 8 to 20 feet (2.4 to 6.1 m.) forms the western side of the harbor entrance.

**Buoys.**—Where this reef encroaches on the entrance channel there are two buoys: A red second-class nun buoy No. 2 moored on north-east point of shoal and a red third-class nun buoy No. 4 moored on southeast point of shoal. The southern bank of Barracouta Ground is marked by a red third-class nun buoy, No. 6.

**Scotch Bank.**—From Fort Louisa Augusta, eastern side of the entrance, a tongue of sand named Scotch Bank, having in places only 2 feet (0.6 m.) of water, stretches northeastward for  $1\frac{3}{4}$  miles, forming the eastern side of the harbor and its approach.

**Buoys.**—The western extremity of Scotch Banks is marked by three buoys: A black second-class can buoy No. 1, moored on north-west point of bank; black third-class can buoy No. 3, moored on western point of bank; and black third-class can buoy No. 5 moored on southwest point of bank.

**Round Reef,** 300 feet across and almost circular in shape, lies 370 yards eastward of Fort Louisa Augusta. Near the center there is a spot bare at low water, and there are several soundings of 1 foot (0.3 m.) on the reef.

**Buoys.**—The northeastern edge is marked by a red and black third-class nun buoy with spindle and ball, the southeastern edge by a red third-class nun buoy, No. 2, and the northwestern edge by a black third-class can buoy, No. 7. The first two buoys also define the western side of Schooner Channel.

**Little Middle Ground.**—A small spot with depths of from 8 to 11 feet (2.4 to 3.4 m.) lies 480 yards north-northeastward from Protestant Cay.

**Buoy.**—There is a spindle buoy off the northeast point of the shoal.

**Lagoon Bank** is an extensive shoal with depths of from 7 to 11 feet (2.1 to 3.4 m.) making off shore northeastward of Gallows Bay.

**Buoys.**—A black third-class can buoy No. 1 marks the northwest point of this bank and another black third-class can buoy the southwestern extension.

**Hans Sorensens Ground,** with a depth of from 5 to 9 feet (1.5 to 2.7 m.), is the southeasterly extension of Long Reef. Shoal water makes out to the northward from Protestant Cay.

**Caution.**—The position of the channels, buoys, and shoals as given on H. O. Chart 2090 are only approximate and are subject to change.

**Fort Louisa Augusta Light,** 52 feet (15.8 m.) above high water, flashing white, visible 9 miles, is exhibited from atop a white house with a red roof. (See Light List.)

**Range Beacons.**—**Entrance Range Beacons** mark the main entrance channel between Great Middle Ground and Scotch Bank. Each beacon consists of two white triangles, points together, on pyramidal concrete bases.

The front beacon is on the former site of Fort Louisa Augusta Flagstaff.

The rear beacon is on a hill 720 yards  $164^{\circ}$  from the front beacon.

**Great Middle Ground Range Beacons** mark the channel between Round Reef and Great Middle Ground. Each beacon consists of two triangles, points together, on pyramidal concrete bases.

The front beacon is 14 feet (4.3 m.) high and is located 695 yards  $291^{\circ} 30'$  from Fort Louisa Augusta Light.

The rear beacon is 50 feet (15.2 m.) high and is 200 yards  $267^{\circ}$  from the front beacon.

**Channels.**—The principal entrance to the harbor is by the channel between Long Reef and Scotch Bank. It is marked by two day ranges and buoys, and has a least charted depth of 21 feet (6.4 m.). There is a passage with a depth of 13 feet (4.0 m.) of water over the southern portion of Scotch Bank, which is used by small vessels coming from the eastward, but it is not recommended for strangers. Schooner Channel, between Round Reef and Fort Louisa Augusta, has 14 feet (4.3 m.) of water in it and is sometimes used by small vessels instead of going to the westward of Round Reef. It is marked by buoys.

**Eastern Channel.**—These is a channel over the inner part of Scotch Bank, with a depth of 13 feet (4.0 m.) in the center, which may be used by vessels of light draft from the eastward, with local knowledge.

**Anchorage.**—Ships of more than 17 feet (5.2 m.) seldom attempt to enter the harbor but anchor outside the channel entrance. Vessels of more than 15 feet (4.8 m.) draft that do enter the harbor usually anchor about 250 yards northeastward of Protestant Cay in 25 feet (7.2 m.). Smaller vessels anchor 200 yards eastward of the southern end of the cay. Local sailing vessels generally go to the stone wall in front of the town.

Seven white can buoys are moored in the harbor for the purpose of working vessels to the anchorage.

**Wind and weather** are similar to that of the remainder of the island. The year is divided into two general seasons: The dry from December to April and the wet, the remainder of the year. During the dry season it is pleasant with a mean temperature of  $76^{\circ}$  F., while during the wet season it is hot and oppressive, the mean temperature being about  $82^{\circ}$  F.

**Tides.**—The high-water interval is 7 hours 30 minutes; spring range 8 inches (0.2 m.), neap range 4 inches (0.1 m.).

**Pilots.**—The pilot station is on Protestant Cay, which lies close off the town, and pilots are at all times quickly in attendance off the entrance, on seeing the usual signal. Strangers are advised to take

a pilot at all times and should never attempt to enter at night without one.

**Directions.**—In approaching Christiansted from the northeastward, vessels should keep Ham Bluff open northward of Baron Bluff until the extreme western point of Buck Islands bears  $156^{\circ}$  distance  $1\frac{1}{4}$  miles, when make good course  $241^{\circ}$  for  $4\frac{1}{4}$  miles when the entrance range will be on. This course will pass 800 yards northward of Scotch Bank. Bring the entrance range ahead on  $164^{\circ}$  and stand in, staying on the range. See view on H. O. Chart 2090. Due to the intricate and tortuous nature of the channel and the constant shifting of the bars, unless fully acquainted with knowledge of local conditions, a pilot should be taken.

Approaching from the westward, give the north coast of St. Croix a berth of 1 mile or more. From 1 mile northward of Salt River Point make good a  $117^{\circ}$  course for 3 miles, when the entrance range beacons will be on, then follow the directions preceding. As Scotch Bank is ahead on this course care must be taken not to over-run this distance.

Vessels approaching from offshore should bring the Entrance Range beacons on before Baron Bluff is shut out by Salt River Point, to avoid running down on Scotch Bank.

A sailing vessel will have to warp out, and buoys are advantageously placed for that purpose.

**Caution.**—Fort Louisa Augusta, the front range mark, has at a distance, no appearance of a fort, and is not easily distinguished. Protestant Cay can easily be mistaken for the fort, especially as a flag is kept flying on the cay, and not on the fort.

Christiansted ( $17^{\circ} 46' N.$ ,  $64^{\circ} 42' W.$ ; *H. O. Charts 1058 and 1059*) occupies a space of about half a square mile on the slope of a hill. It is the capitol and largest city on St. Croix, although not the most important, commercially. It is well laid out with broad clean streets. There is an observatory on a hill 440 feet (135.3 m.) high about a mile eastward of the town. The population of the city is about 6,000.

**Wharfage.**—There is no wharf suitable for large steamers. All unloading and loading is done by means of lighters. There are wharfs with 9 feet (2.7 m.) alongside, equipped with 10-ton cranes.

**Repairs.**—There are no facilities for repairs.

**Supplies.**—Provisions, ice, ship chandler's stores in small quantities, and some lumber may be obtained at Christiansted. There is no coal in large quantities available. Water may be obtained.

**Communications.**—There is steamship communication with New York, South America, and West Indian ports. There is cable communication with the rest of the world through Porto Rico, St. Thomas, St. Lucia, and Trinidad. There is telephone connection with Frederiksted.

**Radio.**—There is a United States naval radio station (call letter N N I) which accepts commercial radio. Hurricane storm warnings are also transmitted. (See H. O. Publication 205.)

**Sanitation.**—The sanitary conditions are excellent.

**Hospitals.**—There is a municipal hospital. Seamen are admitted.

**Buck Island and Reef.**—Buck Island, 330 feet (100.6 m.) high, lies  $4\frac{1}{2}$  miles northeastward of Fort Louisa Augusta, and about 1.3



miles from the coast of St. Croix. It is 1 mile in length east and west, 700 yards in breadth, and is situated on the southern edge of a coral bank, which extends westward about 1,500 yards and sweeps round 1 mile north of the island, forming a spit resembling a beak  $1\frac{1}{2}$  miles in length east and west, and named Buck Island Bar. There are also several shallow patches as far eastward as  $1\frac{3}{4}$  miles. The island lies directly in the route to Christiansted Harbor and should be carefully approached.

Ham Bluff, the northwestern extremity of St. Croix, kept well open of Barons Bluff, bearing  $261^\circ$ , leads well northward of the reef; these bluffs in range will lead 400 yards outside the reef in 4 fathoms (7.3 m.) of water.

**Buck Island Channel—Anchorage.**—There is good anchorage in 4 fathoms (7.3 m.) to the southwestward of Buck Island. The usual way of approaching it is from the northward round the western end of the reef. The latter may be passed by the eye or by bringing the ruins on knoll 122 feet (37.2 m.) high northwestward of mill near Pull Point, in range with Sight Mill, bearing  $196^\circ$ . The mill stands on the center ridge of hills, which is here lower than elsewhere, and has neither head nor vanes. In running in upon this mark, however, the vessel will cross over 27 or 28 feet (8.2 to 8.5 m.) of water and the water will deepen to 7 fathoms (12.8 m.) southeastward of the island. Soon after passing within the edge of the bank she may anchor as convenient.

A vessel may enter Buck Island Channel from the southeastward by running in between the island and the reef skirting St. Croix, keeping the northern extremity of Green Cay in range with Mount Eagle, bearing  $267^\circ$ . The latter from this direction will show as the left of two hills, apparently very nearly of the same height; the northern one is Salt River Mount, rising near the shore 2 miles farther eastward. The least water will be  $5\frac{3}{4}$  fathoms (10.5 m.), the depth generally being more than 10 fathoms (18.3 m.). Care must be taken to keep the range on until the vessel is abreast Buck Island.

**Channel Rock**, awash, lies 800 yards southward of this range line and  $1\frac{3}{4}$  miles west-northwestward of East Point.

**Coast.**—From Green Cay the shore of St. Croix is skirted by a reef all the way to the eastern end. Within it there is a snug anchorage for small craft, which find their way through a small cut north of Coakley Bay and warp up if necessary.

**Lang Bank**, an extensive bank of soundings from about 3 to 5 miles broad, stretches 9 miles northeastward from St. Croix, including Buck Island Reef on the north and west. Along its edge there is one of those remarkable wall-sided, narrow coral ledges

which, commencing about 3 miles eastward of Buck Island Reef, sweeps round in a convex form for about 14 miles, terminating  $164^{\circ}$  2 miles from the eastern end of the island. Its northern part is from  $\frac{1}{2}$  mile to 1 mile broad and has a depth of from 6 to 10 fathoms (11.0 to 18.3 m.) on it and is known as Lang Bank; the southern portion is from a little more than 100 yards to 600 yards broad and has from  $6\frac{1}{2}$  to 10 fathoms (11.9 to 18.3 m.) on it.

The shoalest part of Lang Bank breaks in heavy weather and becomes dangerous and should be given a wide berth.

## CHAPTER III

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### THE LEEWARD ISLANDS, SOMBRERO TO ANTIGUA, INCLUSIVE

**ANEGADA PASSAGE** (*H. O. Chart 1002*).—This passage, over 30 miles wide, separates the Virgin group of islands from the group composing the Leeward Islands. Sombrero Island, in the north-eastern portion of the channel, and St. Croix Island, in the south-western portion are the leading marks through this passage, as lights are maintained on these islands. Until the establishment of the lighthouse on Sombrero Island numerous vessels were wrecked on this island and the dangerous reefs which surround it. Now the landfall sought by vessels from the northward is Sombrero Lighthouse, from which an accurate departure can be taken, making the Anegada Passage perfectly safe with ordinary care and attention.

**SOMBRERO ISLAND** ( $18^{\circ} 36' N.$ ,  $63^{\circ} 28' W.$ ; *H. O. Chart 3716*) is 1,800 yards long and 400 yards broad, and at its northern end it is about 20 feet (6.1 m.) high; thence it ascends gradually to the middle of the island, where it attains a height of 40 feet (12.2 m.). Its surface is exceedingly rough and rises in sharp jagged points. The crevices between appear to have been scooped out by the rain and sea water, dissolving the coral rock of which the island is composed. The vegetation consists of a few small beds of prickly pear. Fish of indifferent quality may be caught in large numbers off the island. The island belongs to Great Britain and is administered by the presidency of the Virgin Islands.

The sides of this island are precipitous and rocky and quite inaccessible except at a little bight on its western side;  $\frac{1}{4}$  mile from the southern end, and a short distance to the southward of a small rock awash, where, under very favorable circumstances, by watching an opportunity, a person may jump onto a flat ledge of the cliff, and with some difficulty ascend to the summit. It lies on a small bank which extends to the eastward  $2\frac{1}{2}$  miles, with 22 fathoms (40.2 m.) on its edge; to the southward  $1\frac{1}{2}$  miles, with 47 fathoms (86.0 m.) at that distance; to the westward  $1\frac{1}{4}$  miles, with from 14 to 24 fathoms (25.6 to 43.9 m.); and to the northward  $1\frac{1}{2}$  miles with 27 fathoms (49.4 m.) coral crust.

From the island the high land of St. Martin is distinctly seen in clear weather, distant 40 miles.

**Sombrero Island Light**, flashing white, 150 feet (45.7 m.) above high water, visible 18 miles, is exhibited from an open iron framework tower, 132 feet (40.5 m.) high, painted red, on the south-eastern side of the island. (See views 6, Appendix V.)

**Anchorage.**—There is an anchorage on the western side of the island in 6 to 7 fathoms (11.0 to 12.8 m.) close to the rocks, also in from 10 to 14 fathoms (18.3 to 25.6 m.). The prevailing winds are from north-northeast to south by east; westerly winds seldom blow.

**ANGUILLA ISLAND** ( $18^{\circ} 12' N.$ ,  $63^{\circ} 05' W.$ ; *H. O. Chart 1834*) is 14 miles long, and the eastern half is from 2 to 3 miles broad, but the western portion tapers gradually away to a point. It has an area of about 35 square miles, and the population was 4,878 in 1918.

The eastern portion of the island is the most elevated, and in the neighborhood of Crocus Bay, near the center of the island, it is 213 feet (64.9 m.) high, but it has no remarkable hills. The western portion declines gradually, and at the end it is only 30 feet (9.1 m.) high. The southern side is generally much lower than the northern, and as far westward as Rendezvous Bay it is fringed with a coral reef, dry in many places, from 200 to 400 yards from the shore and steep-to. There are, however, several little cuts through it which will admit boats of large size into good shelter. The island belongs to Great Britain and is administered by a magistrate, under the Presidency of St. Christopher.

Road Bay is the port of entry and the location of the custom-house.

**Communication.**—A regular mail service by a subsidized sloop has been established between Anguilla and St. Christopher.

**Anguilla Bank** extends about 17 miles northward of the island, where from a depth of about 35 fathoms (64.0 m.) it drops to no bottom at 100 fathoms (182.9 m.). Depths of less than 20 fathoms (36.6 m.) extends some 8 miles northward of the island, and there is a patch of 9 fathoms (16.5 m.) at 5 miles distance.

**Rendezvous Bay**, on the southern shore, affords good shelter to small vessels. In entering the bay give a berth to the reef, which extends  $\frac{1}{4}$  mile off Shaddick Point, the eastern limit of the bay. It can be seen from aloft. From Blowing Point, about a mile eastward of Shaddick Point, there is a road leading to the two anchorages, Road and Crocus Bays, on the western coast.

**Blowing Rock** is a small rocky islet, about 6 feet (1.8 m.) above the sea, lying 1,500 yards  $128^{\circ}$  from the western end of Anguilla. It

is bold and steep-to outside, but within it there is a channel for boats only.

**Anguillita** is a small rocky cay, 20 feet (6.1 m.) high, and covered with brushwood, lying 300 yards  $246^{\circ}$  off the western end of the island, to which it is almost connected by coral heads, having a passage for boats only. It is bold and steep-to on its southwestern side.

**South Wager** is a small barren rock, about 20 feet (6.1 m.) high, lying about 400 yards from the northern shore of Anguilla, at  $1\frac{1}{4}$  miles from its western end, which is here formed of remarkable low cliffs. The rock comes conspicuously in sight after rounding Anguillita and is steep-to.

From abreast South Wager the shore to Mead Point, at the eastern end of Long Bay, is clear, and may be approached freely. From Mead Point to Road Bay,  $2\frac{1}{4}$  miles eastward, the coast is composed of remarkable perpendicular cliffs, 150 feet (45.7 m.) high.

**Dowling Shoal.**—Dowling Shoal is about  $1\frac{1}{2}$  miles in extent east and west and 1,500 yards north and south. Its western edge lies north of Mead Point, and the channel between, which has an average width of 700 yards and carries a depth of from 6 to 9 fathoms (11.0 to 16.5 m.). Small vessels leaving Road Bay may run through it, but in beating up from the westward it is better to keep outside the shoal. Fork Mountain, in St. Martin, open west of Mead Point, bearing  $157^{\circ}$ , leads nearly  $\frac{1}{2}$  mile westward of the shoal.

**Dowling and Sandy Islets.**—On the northern edge of the shoal there is a small rocky islet of the same name, which is awash, with no part showing above water. It is steep-to on the northwest, but foul to the distance of  $\frac{1}{4}$  mile to the northeast.

Nearly  $\frac{1}{2}$  mile  $108^{\circ}$  from the islet, on the eastern edge of the shoal, is a small, low, sandy cay, called Sandy Islet, covered with brushwood to the height of 6 feet (1.8 m.); there is no safe channel between, and to the south and southeast it is foul for more than 700 yards.

Three and One-half Rock, with a depth of  $3\frac{1}{2}$  fathoms, (6.4 m.), lies 1,800 yards  $234^{\circ}$  from Dowling Islet.

**Road Bay** ( $18^{\circ} 12' N.$ ,  $63^{\circ} 07' W.$ ; *H. O. Chart 371a*) is a small bight about 1,500 yards deep, affording good anchorage in depths up to 4 fathoms (7.3 m.), for small vessels. It is the best and safest anchorage in the group, with excellent holding ground. There is no danger in the bay. The bluff point to the northward is steep-to, and a vessel may anchor as convenient.

**Light.**—A fixed white light, visible 5 miles, is shown at a height of 100 feet (30.5 m.) above high water from a mast 20 feet (6.1 m.) high, on the point on the northern side of Road Bay.

**Village.**—On the narrow ridge of sand at the head of the bay there is a small village, and back of it an extensive salt pond.

**Supplies.**—Yams may be purchased. Fresh water is scarce and what there is is slightly alkaline and unpleasant to the taste. Fish are plentiful but apt to be poisonous.

**Crocus Bay** ( $18^{\circ} 13' N.$ ,  $63^{\circ} 05' W.$ ; *H. O. Chart 371a*) is formed by perpendicular white wooded cliffs. The bay is limited to the northward by Flat Cap Point, so called from its terminating in a small flat-topped rock.

The principal settlement is in the southeastern corner of the bay, and the houses are scattered about the valley and adjacent hills. A house, formerly used as a customhouse, with its flagstaff, stands on the southern side of the bay, on the summit of a hill 213 feet (64.9 m.) high, the loftiest in the island.

At 300 yards northeastward of this house is the courthouse, more conspicuous, with a large flagstaff; close northward of the latter is a small building with a tall tree by it, and this tree is the first object that can be made out when approaching from the westward.

In the middle of the bay, about 1,500 yards  $235^{\circ}$  from Flat Cap Point, is a coral patch with 5 fathoms (9.1 m.) over it. In approaching, this spot should be avoided.

**Anchorage.**—A good berth will be found with Flat Cap Point bearing  $21^{\circ}$  and a house formerly used as a customhouse  $128^{\circ}$  in 6 fathoms (11.0 m.) of water, sandy bottom, and excellent holding ground. The bay is open to the westward, but winds seldom blow from that quarter. Heavy rollers, however, frequently set in with violence, making the anchorage rough and landing difficult.

The best landing place is a little to the northward of the road leading up the valley, but there is always a heavy surf on the beach.

**Directions—Road and Crocus Bays.**—A stranger bound to either Crocus or Road Bay had better run to westward of Dog Island and pass between North Wager and Dowling Shoal. If from the east or southeast, run through the clear bold channel between Anguilla and St. Martins, haul around Anguillita, and act in the same way. There will be no difficulty in doing this; there is seldom any current; the water is smooth, and if overtaken by night good anchorage will be found anywhere under the southern side of the cays and reefs northwest of Crocus Bay, taking care, however, to avoid Dowling Shoal. Vessels when leaving the bays and bound to northward, with the assistance of a pilot, obtained at shore, may take the northern channel.

**Supplies—Crocus Bay.**—Fresh provisions and firewood may be obtained at Crocus Bay, but no water. Yams are abundant and of excellent quality.

**Northern Channel.**—This opening is between the eastern end of Seal Islands Reef and Flat Cap Point and is  $1\frac{3}{4}$  miles wide, with depths of 9 to 15 fathoms (16.5 to 27.4 m.).

**Middle Bank.**—In the center of Northern Channel but rather nearer Anguilla, there is a dangerous, narrow ledge, named Middle Bank,  $\frac{1}{2}$  mile long, on which the depth is from 20 to 24 feet (6.1 to 7.3 m.). The bottom is distinctly seen on this bank, and with the heavy sea, which generally prevails here in the winter season, it frequently breaks and becomes dangerous, as no good range can be given to aid in avoiding the danger although there is a clear channel on either side.

**Seal Islands and Reefs.**—Seal Island Reefs commence a little eastward of the Flirt Rocks and continue unbroken to the eastward, where they form the western side of the northern channel into Crocus Bay and are about 5 miles in length. On their northern side they are bold and steep-to, and dangerous to approach in the night, for the soundings are not sufficiently regular to enable a vessel to come nearer than 4 miles; at this distance the depth is 18 fathoms (32.9 m.); within that, from 14 to 16 fathoms (25.6 to 29.3 m.) close up to the reef. The southern side is composed of detached shoals and coral heads, which extend 1,500 yards from the main body of the reef.

At about  $1\frac{1}{2}$  miles to the eastward of the Flirt Rocks are several low rocky islets, called the Seal Islands, about 5 or 6 feet (1.5 to 1.8 m.) above high water.

The southern of the eastern end of these reefs breaks in heavy weather and is steep-to; but foul ground extends out  $\frac{1}{4}$  mile from its northeastern side and is extremely dangerous.

**A range.**—The house formerly used as a customhouse in range with West Peak St. Martin will lead 1 mile to eastward of this shoal but care must be observed to change course to the southwestward when Seal Islands Reef is abeam to avoid Middle Bank.

**North Wager** is a small black square rock, about 3 feet (0.9 m.) high, lying on the southern side of Seal Island Reefs, about 1,500 yards to the eastward of the Prickly Pear Cays. In standing in toward Crocus Bay it serves as a guide when approaching the reef, and a vessel should not stand within or to the northward of it.

**Prickly Pear Cays** (*H. O. Chart 1834*) are two small islets lying east and west of each other, and separated by a small boat channel. The western cay is a narrow, rugged rock about 1,500 yards in length, covered with brushwood to the height of 25 feet (7.6 m.), upon which there is no landing. The eastern cay is a little lower, slightly wooded, with sandy shores, and about  $\frac{1}{2}$  mile long and  $\frac{1}{4}$  mile broad; landing may be effected here with care in a little bight on the western side.

**Anchorage.**—To the southward of North Wager from Prickly Pear Cays to Crocus Bay, there is excellent anchorage in 9 or 10 fathoms (16.5 or 18.3 m.) of water, over sandy bottom and out of the influence of the rollers.

**Flirt Rocks** are two small rocky islets; the northwestern, the higher lying about 1,500 yards northward of the Prickly Pear Cays, is 20 feet (6.1 m.) high. They are foul all around, but only to a short distance.

**Dog Island** is the westernmost of a group of small islets and cays extending westward from the northwestern side of Anguilla. It is  $1\frac{1}{2}$  miles long east and west, in the center about 1,500 yards broad, and about 80 feet (24.4 m.) high, and thence tapers gradually to points at its extreme ends. It is covered with brush and grass, affording pasturage to an excellent breed of horses and sheep.

The eastern end and southern side of Dog Island are bold and steep-to. At 400 yards from the center of the southern shore there is a remarkable small black rock, named Bay Rock, 4 feet (1.2 m.) above the sea, and nearly abreast of it, just within the bluff, rocky point which forms the southern extremity of the island, is the landing place. The western end of the island is formed by a high, perpendicular cliff, and from it a broken ledge of rocks extends about 1,500 yards to the westward, terminating at a small, low, rocky islet, called West Cay, 6 feet (1.8 m.) above the sea and steep-to on its western side.

From West Cay the ledge of broken rocks continues to sweep round the northern side of the island to the eastern end. Near the center, at  $\frac{1}{4}$  mile from the shore, is Mid Cay, a remarkable, small, barren islet, its northeastern side being a perpendicular black cliff 60 feet (18.3 m.) high. It stands on the edge of the ledge and on the very brink of soundings; there is no bottom at 100 fathoms (182.9 m.) within 1 mile of it.

One mile to the eastward of Mid Cay and similarly situated is another small, low, rocky islet named East Cay, covered with brushwood and equally steep-to on its northern side.

**Caution.**—In the daytime West Cay may be passed within  $\frac{1}{4}$  mile without fear, but in the night it should be approached very guardedly, for the soundings are so deep alongside it that the lead will be of little use; within a mile of the cay the depth is from 17 to 20 fathoms (31.1 to 36.7 m.).

**Dog Island Channel.**—Between Prickly Pear Cays and Dog Island there is a clear channel  $2\frac{1}{2}$  miles wide, with a depth in it of from 9 to 10 fathoms (16.5 to 18.3 m.) to within  $\frac{1}{2}$  mile of the western Prickly Pear, when the soundings become so irregular that in strong winds, especially when accompanied by rollers, the sea tops



and frequently breaks. It will, therefore, be always better to pass to the westward of Dog Island, except with a free wind and smooth sea.

**Shawl Rock.**—Two miles eastward of Flat Cap Point the western end of a dry reef commences and trends to the northeastward at nearly a mile offshore, and 4 miles from the point and  $\frac{1}{2}$  mile outside the main body of the reef there is a dangerous rock, named Shawl, which does not always break, and is steep-to. The shore then continues foul to within 1 mile of Snake Point, the northeastern end of Anguilla. In standing to northeastward the vessel's safety will be insured when approaching this reef and rock by proper attention to the lead, for here the 20-fathom (36.6 m.) curve runs along at  $1\frac{1}{2}$  miles from the shore, decreasing suddenly.

Within the reef, at the western end, there is good shelter for a boat, and through a narrow intricate opening near the eastern end droghers find an anchorage.

**Scrub Island** is separated from Anguilla by a narrow channel of deep water about  $\frac{1}{4}$  mile wide, but it should not be used, as its western side is skirted by a reef nearly dry to a distance of 200 yards, upon which a vessel may be forced by the sudden flaws which come off the lee side of all these islands.

This island lies on the same line of direction as Anguilla and is 2 miles long and  $\frac{1}{2}$  mile broad; it is covered with brushwood and stunted trees, which at the western end are about 50 feet (15.2 m.) above the sea. The eastern end is low, and from it extends a narrow strip of low rocks to the distance of  $\frac{1}{2}$  mile; they are 8 or 10 feet (2.4 to 3.0 m.) high, steep-to, and generally the sea breaks violently over them, but in approaching them from the northeast they are hidden under the high part of the island and are exceedingly dangerous, for the soundings are so deep, the depth being 27 fathoms (49.4 m.) within  $\frac{1}{2}$  mile of them, that the lead will scarcely give warning.

Near the center of the northern shore of Scrub Island there is a little hill of white sandstone, which, when the sun shines on it, is very remarkable. There is tolerable landing at the beach at the north-western end of the island and good shooting.

**Little Scrub Island** lies about 1,500 yards westward of the above bill and is equally conspicuous from the contrast in color, it being a barren, precipitous black rock 40 feet (12.2 m.) high and steep-to.

**Caution.**—Anguilla and the small islands and cays just described are so low in comparison with St. Martin that when approaching them from the northward at night, because they are backed by the highlands of that island, it is extremely difficult to estimate the distance from them, and in attempting to do so frequent accidents have happened on the northern side of Anguilla.

**ST. MARTIN ISLAND** ( $18^{\circ} 04' N.$ ,  $63^{\circ} 04' W.$ ; *H. O. Chart 1834*) is very irregular in outline, the shores being deeply indented by numerous bays and creeks, some of which afford good anchorage. The northern part, which is two-thirds of the island, belongs to the French and is attached to the Government of Guadeloupe and the remainder to the Dutch, governed by Curacao. Most of the inhabitants of the Dutch section speak English.

The western end of the island terminates in a dangerous, low, sandy point. The northeastern end is high and bold; and being separated from the main ridge by a deep, broad valley, when seen at a distance from the west-northwest or east-southeast it has the appearance of a separate island. The southeastern end is formed by a high bluff, faced by a perpendicular white cliff, from which it receives the name of Blanche Point.

This island is of moderate elevation, the loftiest table ridge, which runs nearly through the center of the island north and south, terminated at the northern end by *Pie de Paradis* 1,360 feet (414.5 m.) high. Besides the tableland, there are several other conspicuous elevations. The Saddle, or Red Hill, at the western end of the island, although only 377 feet (114.9 m.) high, is a striking object when seen from the north of Dog Island. *Morne de la Fortune*, 293 feet (89.3 m.) high, on the eastern side of *Simson Lagoon*, forms a bold promontory and conical peak. The southernmost bare rocky peak of the western range of hills, 900 feet (274.3 m.) high, which when seen from the northwest and southeast resembles a colossal face leaning backward to the southwest, and the little conical hill, 697 feet (212.4 m.) high, on the western side of *Grande Bay*, are all very remarkable.

**Tides.**—The height of the tide at St. Martin is from 2 to 3 feet (0.3 to 0.6 m.). The movements of the tide are most irregular and it is impossible to predict with any accuracy the times of high and low water.

**Wind and Weather.**—The winds in this vicinity are normally moderate and from the northeast. It rains infrequently and the water is rapidly absorbed.

**Population.**—The population of the French part of St. Martin was 3,200 in 1914 and of the Dutch part was 2,312 in 1926.

**Grande Bay** ( $18^{\circ} 01' N.$ ,  $63^{\circ} 03' W.$ ; *H. O. Chart 371a*), at the southeastern end of St. Martin, is the principal anchorage in the Dutch quarter.

**Aspect.**—The eastern side of the bay is a mile in length and is formed by a lofty promontory which terminates to the southward at Blanche Point, the southern part of a ridge 441 feet (134.1 m.)

high; the western side is formed by a flat, narrow, rocky neck of land 104 feet (31.7 m.) high and nearly 400 yards in length, connected to the mainland by a low sandy ridge, which, with the line of shore to the northward, makes this side nearly 1,500 yards long. Fort Willem, shown on the charts westward of the town, is in ruins and can not be distinguished from seaward. On the extremity of the ridge stand the ruins of Fort Amsterdam and the barracks.

At the head of the bay is the town of Philipsburg, the seat of the Dutch Government.

The entrance between the headlands is a mile wide and free from dangers. (See view on H. O. Chart 371a.)

**Depths.**—At about  $\frac{1}{4}$  mile northwest of Blanche Point is the beginning of a narrow sand bar, which leaves the shore and sweeps round the eastern and northern sides of the bay at a distance of from  $\frac{1}{4}$  to  $\frac{1}{2}$  mile, with from 6 to 10 feet (1.8 to 3.0 m.) of water, on it. Within it there is a narrow, deep channel of from 12 to 15 feet (3.7 to 4.6 m.) of water, and about  $\frac{1}{4}$  mile from the western shore there is a cut in the bar, where there is a depth of 11 feet (3.4 m.). There is a similar cut at the eastern end, but the wind under the high land is so uncertain that it is quite unavailable to sailing vessels.

**Grande Bay Light**, fixed white, 120 feet (36.6 m.) above high water, visible 10 miles, is exhibited from a lantern on a stone base 18 feet (5.5 m.) high at Fort Amsterdam.

**Anchorage.**—There is good anchorage in Grande Bay between Amsterdam and Grande Points in about 6 fathoms (11.0 m.) with good holding ground.

There is an excellent anchorage for sailing vessels about  $\frac{1}{4}$  mile from the western shore, inside the bar, in 11 feet (3.4 m.), but as the channel leading to it is unmarked it would require one familiar with local conditions to find this channel.

A landing pier, 154 feet in length, is situated to the southward of the Stadt House and is available for small craft.

**Light.**—A red light is shown from the landing pier.

**Dangers—Proselyte Rock.**—This very dangerous rock has only  $2\frac{1}{4}$  fathoms (4.1 m.) on it and seldom breaks in the strongest winds. It is not more than 35 yards in extent,  $1\frac{1}{4}$  miles  $226^{\circ}$  from Blanche Point.

The southern and southwestern sides of this rock lie just within the 10-fathom (18.3 m.) curve, and a ledge from 6 to 9 fathoms (11.0 to 16.5 m.) runs off to the distance of about 1,500 yards to the southeastward of it, which serves as a warning when approaching it from that quarter.

**Shoal.**—One thousand yards,  $236^{\circ}$  from Grande Bay Light, there is a shoal about 100 yards in extent, having  $4\frac{3}{4}$  fathoms (8.7 m.) of water on it.

**Radio.**—There is a radio station at Philipsburg, normal radius 500 miles by day and 1,000 miles by night. Call letters, PJD.

**Directions.**—When approaching Grande Bay from the eastward, round Blanche Point at the distance of  $\frac{1}{4}$  mile, then haul up gradually into the bay, prepared to meet the eddy winds and sudden gusts which rush off from the highlands to the northeast; anchor in the center of it, in a depth most convenient to the vessel's draft, bearing in mind that within the depth of 5 fathoms (9.1 m.) the soundings decrease rather suddenly to  $3\frac{1}{2}$  and 3 fathoms (6.4 and 5.5 m.).

Vessels of heavy draft approaching from the westward should avoid the  $4\frac{3}{4}$ -fathom (8.7 m.) spot lying about 1,000 yards south-westward of Fort Amsterdam.

In approaching the bay from the southward great care must be taken to avoid Proselyte Rock.

In standing in for Grande Bay from the southward to eastward of Proselyte Rock do not bring Blanche Point to the eastward of north, or open out Oostenberg, a conical peak to the westward of the point, until within the rock.

In standing inshore from the westward, when approaching the rock, do not open The Groupers to the left or northward of the highest hill at the eastern end of St. Bartholomew. When leaving the anchorage and clear to the westward of the rock, the vessel stands to the eastward when The Groupers come open to the northward of St. Bartholomew.

**Philipsburg** ( $18^{\circ} 01' N.$ ,  $63^{\circ} 03' W.$ , *H. O. Chart 371a*).—On the low, narrow sand ridge at the head of the bay is Philipsburg, the chief town and seat of government; and at the back of it is the most valuable salt pond in the island, 4 feet 8 inches (1.4 m.) below the level of the sea.

**Pelican Point.**—To the westward of Amsterdam Point the southern shore of St. Martin is composed of small sandy cays, separated by bold woody heights, steep-to, for the distance of  $2\frac{1}{4}$  miles, where it terminates at Pelican Point, a low rock point forming the eastern end of Simson Bay. From this point a narrow ledge, on which there are from 2 to 4 fathoms (3.7 to 7.3 m.) of water, extends out  $\frac{1}{2}$  mile to the southward, and about 300 yards to the northwestward of the point are the Pelican Rocks, 3 or 4 feet (0.9 or 1.2 m.) above the sea.

**Simson Bay.**—From Pelican Point a low, sandy shore sweeps around to the westward, forming Simson Bay, with indifferent anchorage in the center of it, midway between the points, in  $4\frac{1}{2}$  fathoms

(8.2 m.) of water. At the eastern end of the bay there is a boat channel into the lagoon. Thence to the western end of the island the shore is low and bounded by sandy beaches, separated by low, rocky, and sandy cliffs.

**Terre Basse Point** is the western extremity of St. Martin. A spit with depths of  $25\frac{1}{2}$  fathoms (5.2 m.) runs 1,500 yards west-south-westward from the point. From Terre Basse Point to Marigot Bay, a distance of 4 miles, the coast is very dangerous as it is fringed with reefs and sand banks for 1 mile from the shore.

**Caution.**—In rounding it in the night time great care must be exercised, as the spit is so steep that the lead will give little or no warning of its proximity. In the daytime the shoal may be seen from aloft. If the weather is so cloudy as to make it difficult to see the shoal, keep Fourche Island (lying  $21\frac{1}{2}$  miles northwest of St. Bartholomew) open to the southward of St. Martin till Terre Basse Point bears  $73^{\circ}$ .

After rounding this point in proceeding toward Marigot Bay do not come within the depth of 7 fathoms (12.8 m.).

**MARIGOT BAY** ( $18^{\circ} 04' N.$ ,  $63^{\circ} 06' W.$ , *H. O. Chart 371a*) lies about 4 miles to the eastward of the western end of St. Martin, and between Marigot Bluff and Arago Point. It is  $1\frac{3}{4}$  miles wide and  $\frac{1}{2}$  mile deep, with excellent anchorage for vessels of moderate draft, protected from all winds but the northwest; it seldom, however, blows strong from this quarter. The bay is exposed to the rollers, which will sometimes break on its southwestern side  $\frac{1}{2}$  mile from the shore and send in a heavy, dangerous surf on the beach.

**Colline Ronde (Round Hill)** is 40 feet (12.2 m.) high and divides the bay into two parts; eastward, the shore is bordered by a coral reef, while northeastward, between the fort and Point Arago is called Baie de la Patence.

Colline Ronde can not be recognized from any great distance seaward, and care should be exercised in using it as a landmark when approaching.

**Depths.**—Between Marigot and Arago Points the maximum depth in the bay is  $5\frac{3}{4}$  fathoms (10.5 m.) located about 1,000 yards north-eastward from Point Marigot. The bay then shoals rapidly to 3 fathoms (5.5 m.) about 1,000 yards from the shore. Five hundred yards north of Point Marigot there are depths of 6 fathoms (11.0 m.).

**Medee Shoal** is the only danger in Marigot Bay. This rocky shoal is nearly circular and 200 yards in width, having on its northeastern edge as little as  $2\frac{1}{2}$  fathoms (4.6 m.) of water, with from  $3\frac{1}{3}$  to 4 fathoms (6.1 to 7.3 m.) to the southeastward of it. It lies 800 yards  $280^{\circ}$  from Arago Point, and the channel between has

from  $3\frac{1}{2}$  to 4 fathoms in it, but it is always better to pass outside the shoal. Red Hill, in range with the eastern side of Marigot Bluff,  $231^{\circ}$ , clears Medee to the northward, and the fort at Marigot, in range with Mount Accords,  $149^{\circ}$ , leads clear of Medee to the westward.

**Marigot Bay Light**, fixed green, 66 feet (20.1 m.) above high water, visible 3 miles, is exhibited from a 25-foot (7.6 m.) mast, painted white, situated at southwest corner of Marigot Fort; it is not visible when bearing southward of  $155^{\circ}$ , being cut off by the hill on which the fort is situated.

**Anchorage.**—There is a good berth for larger vessels in  $5\frac{1}{2}$  to 6 fathoms (10.1 to 11.0 m.), with excellent holding ground in sand and gravel about  $\frac{1}{2}$  mile eastward of Point Marigot. Bearings: Point Marigot headland,  $266^{\circ}$ ; Round Hill,  $153^{\circ}$ ; ruins of Fort Marigot,  $111^{\circ}$ .

Smaller vessels can approach near to the town and anchor in accordance with their draft.

Small vessels can find good anchorage in the Baie de la Patence under the lee of Point Arago.

**Pilot.**—The master of the port acts as pilot for Marigot Bay.

**Directions.**—In approaching Marigot Bay from the eastward, keep the Saddle or Red Hill, at the west of St. Martin, in range with the northwestern side of Marigot Bluff, bearing  $223^{\circ}$ , until Colline Ronde (difficult to see) comes in range with Morne Fortune Peak,  $173^{\circ}$ , then stand in and anchor on this range, or a little to northeastward of it, in 4 fathoms (7.3) of water, with Marigot Bluff bearing  $257^{\circ}$ ; it is not advisable to go farther in unless in small vessels, when a berth may be taken up according to draft, being guided by the chart.

At night, as long as Fort Marigot Light is visible, a vessel will pass to the westward of Medee Shoal. From the northeast the light is not visible until bearing  $155^{\circ}$ .

**MARIGOT** ( $18^{\circ} 04' N.$ ,  $63^{\circ} 06' W.$ ; *H. O. Chart 371a*) is situated at the head of the bay beneath the ruins of Fort du Marigot, 311 feet (94.8 m.) high, and is the seat of government for the French portion of the island.

**Pier.**—At the foot of Fort Hill there is a small wharf. Except at this wharf, landing is inconvenient. After effecting a landing, the boat should lie off at a grapple to the eastward of Colline Ronde.

**Communications.**—Twice a month a sailing vessel carries the mails to Guadeloupe. There is also radio communication through the radio station at Philipsburg.

**Coast.**—From Arago Point to North Point the shore is clear and steep-to, the soundings regular, and it may be approached to  $\frac{1}{2}$  mile.

**Grand Case Bay** is a deep sandy bay to the southward of Crole Rock and is a secure anchorage for droghers. In entering it they

are guided by the eye. From the head of this bay an extensive low valley, in which there are several salt ponds, runs across to Orient Bay, on the opposite side of the island.

**Buoy.**—A red buoy marks the northern edge of a rock 800 yards off the southern point, with a flat of sand and gravel between.

**Crole Rock.**—The most remarkable object on this part of the coast is Crole Rock, a small, barren, black, rocky islet, with a rounded summit, rising on its northern side 120 feet (36.6 m.) perpendicularly from the sea. It lies about  $1\frac{3}{4}$  miles westward of North Point and 400 yards from a point adjacent to the rock. It is equally remarkable, from its terminating in a detached conical peak of somewhat greater elevation.

**North Point.**—The northern point of the island is skirted by a reef for 400 yards, which always shows itself and is steep-to.

**Spaniard Rock.**—The channel between Tintamarre and Pinels Island Reef is obstructed by Spaniard Rock, a small, dangerous coral head, just beneath the surface about  $1\frac{1}{4}$  miles eastward from North Point. In moderate weather it does not show itself, but with a fresh breeze the sea breaks heavily on it. The channel should not be attempted except from absolute necessity.

Vessels running or beating through the channel between St. Martin and Anguilla have only to be careful when approaching this danger not to shut in Crole Rock. See views on H. O. Chart 1834 for ranges to pass north, northeast, and southeast of Spanish Rock.

**Tintamarre Island** (called also Hat or Flat Island) is a small uninhabited island lying 2 miles eastward of the northern point of St. Martin.

The northern side is formed by a bold, rocky cliff, topped with trees, which toward the eastern end rises almost perpendicularly from the sea to the height of 90 feet (27.7m.) and when seen from the eastward is very remarkable. Its southern and western sides are low and sandy. It is bordered on all sides but the west by a coral reef, which extends  $\frac{1}{4}$  mile from the northern shore and  $\frac{1}{2}$  mile from the southern, and terminates at that distance from the southwestern point of the island. There is tolerable landing in the sandy bay at the western end, and a small vessel will find temporary anchorage at about  $\frac{1}{2}$  mile from this part of the shore in 8 or 9 fathoms (14.6 to 16.5 m.) of water.

The channel between Tintamarre Island and Pinels Island is a mile wide and has depths of from 10 to 12 fathoms (18.3 to 21.9 m.), but should not be attempted unless the ranges to avoid Spanish Rock are in view.

**Orient Bay** lies about  $1\frac{3}{4}$  miles southward of North Point, and its entrance, about  $\frac{1}{2}$  mile wide, is between two small islands surrounded

by dry reefs. From Pinels, the northern island, the reef extends off to the distance of nearly  $\frac{1}{2}$  mile. The bay is about a mile deep, and vessels sometimes visit it with the assistance of a pilot; but being exposed to the full force of the trade wind and heavy sea, it is only secure for droghers or small fore-and-aft vessels, which find shelter at both ends of it.

From the southern island the shore becomes foul and dangerous as far to the southward as abreast Guano Cay. Nearly midway, however, there is a small cut leading into a well sheltered creek called Oyster Pond.

**Oyster Pond** ( $18^{\circ} 03' N.$ ,  $63^{\circ} 01' W.$ ; *H. O. Chart 371a*) has a depth of 10 feet (3.0 m.), and small vessels may lie here in security during the hurricane season. The channel is so narrow and crooked that it can only be navigated by the most expert pilots, and then only under favorable circumstances.

**Caution.**—In general the sea is so heavy on the eastern side of St. Martin that the shore should not be approached by large vessels within the line of the adjacent islets, except in case of necessity.

**Guano Cay** (*H. O. Chart 1834*) is nearly  $\frac{1}{2}$  mile eastward from the nearest shore. This is a small rocky islet rising almost abruptly from the sea to the height of 100 feet (30.5 m.) and is slightly wooded. It is bold-to on its southwestern and southeastern sides, but 600 yards to the north-northeastward of it there are two small rocks just above water, over which the sea breaks heavily.

**Mollibeday Rock**, 1 mile eastward from Guano Cay, is similar in form and appearance to Guano Cay, and its rocky sides, partially wooded, rise abruptly to 100 feet (30.5 m.) above the sea. It is foul on its southeastern side to the distance of  $\frac{1}{2}$  mile; and  $\frac{1}{4}$  mile east-southeastward from it there is a small ledge of rocks a little above the surface of the water which always shows themselves by the breakers.

There is a clear channel 1,500 yards wide between Mollibeday Rock and the Hen and Chicks, and also between it and Guano Cay; but they should only be used in case of necessity, especially the latter, which is about  $\frac{1}{2}$  mile wide.

**Hen and Chicks** are the outermost rocks on the western side of the channel between St. Bartholomew and St. Martin and lie 2 miles  $81^{\circ}$  from Blanche Point. They are a cluster of small rocks; the southwesternmost is 15 feet (4.8 m.) high, but the others are not more than 4 feet (1.2 m.), and they are steep-to on all sides.

**ST. BARTHOLOMEW ISLAND** ( $17^{\circ} 54' N.$ ,  $62^{\circ} 50' W.$ ; *H. O. Chart 1834*) (frequently called St. Barts) is a French possession, having been ceded by Sweden to France in 1878. It is a part of the



French West Indies and is governed from Guadaloupe. Its exports are unimportant. The population is estimated to be about 4,000.

**Aspect.**—The island is of irregular shape, the coast line being indented with numerous small bays, separated by rocky headlands. The hills, which compose the large part of the island, are only moderately high, the highest, in the central part of the island, being 992 feet (302.4 m.) high. Near the east central part of the island there are three hills which form an elongated triangle, therefore when seen from a distance on bearings south-southwest, west by south, and northwest by north they appear as two hills, the eastern being 992 feet (302.4 m.) high and more pointed than the others, the southern 861 feet (262.4 m.) high, and the northern 821 feet (250.2 m.).

The northern and eastern sides of the island are fringed, to a short distance from the shore, by a coral reef which always shows itself; and off its sides are several small rocky islets, which will be described later.

**Tides.**—At all the islands of this group, viz, Dog Island, Anguilla, St. Martin, and St. Bartholomew, there is a rise and fall of from 1 to 2 feet (0.3 to 0.6 m.), but the periods are so irregular that the exact time of high water can not be correctly defined. The following observations, made by Doctor Fahlberg, a resident of these islands for a long period, are valuable and no doubt give the best information on the subject:

“About St. Bartholomew the flood at full and change runs south-east, and it is then generally high water at 10.30 p. m., while the sun is farthest to the north of the Equator, but comes about two hours sooner in the succeeding months until the sun gets farthest to the south, when it is high water at 10.30 a. m., and it runs afterwards in the same proportion back again. The winds, which are of long continuance, sometimes make a trifling difference. The sea is always lowest at the time when the sun is farthest to the north, and the contrary.”

During the surveys of these islands, which were conducted during the winter season between the months of November and March, neither tidal nor ocean current was detected except on one or two occasions when at anchor in Crocus Bay, on the northern side of Anguilla, a strong easterly or weather set was observed, and on one occasion to the eastward of St. Bartholomew, after a long period of strong trade wind, a westerly set ran for a short time 1 mile an hour, but in general no difficulty was found in beating up from one island to the other.

**Bank.**—St. Bartholomew Island forms, with St. Martin, Anguilla, and Dog Islands, another distinct group, lying upon the western edge of a separate bank of soundings of considerable extent, composed chiefly of shells, gray and white sand, with a little coral.

From St. Bartholomew the bank extends 27 miles east-southeastward, where it terminates in a small tongue or spit, separated from the main bank by a remarkable narrow vein of deep water, about 13 miles from the east or tip end; and which ends is only about 13 miles westward of Antigua Bank.

Eastward of the island the bank extends 14 miles, to the northeast 8 miles, and to the southwest 6 miles.

From Scrub Island ( $18^{\circ} 17' N.$ ,  $62^{\circ} 57' W.$ ; *H. O. Chart 1834*), lying close to the northeast point of Anguilla Island, this bank extends 25 miles eastward and terminates in a point; thence the edge trends westward, until it reaches within  $4\frac{1}{2}$  miles north of the island; it then turns abruptly to the northward for a distance of 12 miles, forming a deep bight, and ends in a tongue 3 miles broad, whence it recurves to the southwest and encircles the group on the west and southwest sides at the distance of 1 to 6 miles.

**THE CHANNEL BETWEEN ST. MARTIN AND ST. BARTHOLOMEW** is free from hidden danger but is not safe to navigate during the night, as many of the small rocky islets are quite low, and being steep-to, the lead gives no warning of their vicinity.

To the northwestward of St. Bartholomew and on the southeastern side of the channel between it and St. Martin are a number of rocky islands.

**Fourche or Five Island** is the largest and loftiest in the channel. It is elbow shaped, the northern arm about 1,500 yards long, the eastern arm north and south  $\frac{1}{2}$  mile, and it is about 400 yards broad. The latter name is given to it consequence of its having five small peaked hills, which at a certain distance have something the appearance of being so many small islets. The two western hills are 349 feet (106.4 m.) high, the others a little lower; therefore at a still farther distance they will be seen as two islands. At the eastern end also at the western end there are small detached rocks lying a short distance from the shore, with a ledge nearly dry between. At about 200 yards westward of the southern point there is also a dangerous small rock, which just shows itself above water; with these exceptions it is bold and steep-to.

**Anchorage.**—There is anchorage off the southwestern side of Fourche Island, where a vessel will ride with ease and safety during the prevailing winds; but it will be prudent for a sailing vessel not to go farther into the bight than about midway between the ends of the island, with the southern point bearing  $99^{\circ}$ ; closer in the wind becomes baffling and unsteady. A vessel of large draft, in case of necessity, wishing to repair damages, may haul in close under the eastern arm, passing westward of the small rock just mentioned. There is good landing in the sandy bay at the northeastern corner.

**Table Rock** lies  $1\frac{1}{4}$  miles  $314^\circ$  from Fourche Island, with a clear passage between. This is a small rocky islet, nearly barren, and when seen from the north or south has somewhat the appearance of a shoe, with the heel to the westward, where it is 25 feet (7.6 m.) high; it is clear all round, and may be approached on its western side within  $\frac{1}{4}$  mile.

**Great Grouper** is a rocky barren islet, almost circular in form, about 300 yards in diameter, and very much resembling in appearance Mollibeday Rock lying  $1\frac{3}{4}$  miles  $218^\circ$  from Table Rock. It rises abruptly on all sides and terminates in a rounded summit 150 feet (45.7 m.) above the sea. A coral ledge of dry and sunken rock extends to the distance of 200 yards from its southern side, leaving a narrow channel of deep water between it and the Little Groupers; from all other quarters it may be approached within  $\frac{1}{2}$  mile, and the channel between it and Table Rock may be navigated freely.

**Little Groupers** form a cluster of small, detached, black, barren rocks, the southernmost lying  $\frac{1}{2}$  mile  $201^\circ$  from Great Grouper. This and the northernmost rock are about 15 feet (4.6 m.) high, but the intermediate ones are much lower; they are steep-to on all sides.

**Boulanger Island**, lying  $1\frac{1}{2}$  miles eastward from Fourche Island, is a small, barren, rugged, rocky islet about 50 feet (15.2 m.) high, rising abruptly from the sea on all sides. About 400 yards eastward of it will be seen a remarkable pillar-shaped rock nearly of the same height, which, from its resemblance to a vessel under sail, is called Sail Rock. Both are bold and steep-to and can not be mistaken.

**Beef Barrel** is a small, square, black rock, only 14 feet (4.3 m.) above the sea, lying nearly  $1\frac{1}{2}$  miles west of Colombier Point, the northwestern end of St. Bartholomew, with a clear channel between it and the 4-fathom (7.3 m.) patch about  $\frac{1}{2}$  mile off Colombier Bay. It is bold and steep-to on all sides but the northwestern, which is foul to the distance of 200 yards.

**Colombier Bay**, at the northwestern end of St. Bartholomew, affords shelter and good temporary anchorage; there is a patch of 4 fathoms (7.3 m.) near mid-entrance.

**Sugarloaf**, lying off the western side of St. Bartholomew, is a remarkable, small, barren, rocky islet 180 feet (54.9 m.) high, having the exact form its name imports when seen from any direction, and, although similar in appearance to the Grouper Rock, its position and greater elevation readily point it out. It is an excellent guide to strangers for finding the entrance of Gustavia Harbor, which from a distance is not easily made out. It is high, bold, and steep-to, except on the northern side, whence a narrow ledge of dry and sunken rocks extends 400 yards in that direction; at its extremity there are two small rocks about 4 feet (1.2 m.) out of the water, bold and steep-to outside.

**PORT DE GUSTAVIA (GUSTAF HARBOR)** ( $17^{\circ} 54' N.$ ,  $62^{\circ} 51' W.$ ; *H. O. Chart 371a*) is located about the middle of the southwestern coast of the island.

**Depths and anchorage.**—In the only part of the port that can actually be called a harbor a small arm of the sea, named the Carenage, will only admit vessels of 5 to 6 feet (1.5 to 1.8 m.) draft. At the entrance to the Carenage vessels of from 8 to 12 feet (2.4 to 3.7 m.) draft may lie. The outer harbor or bay is a commodious and safe anchorage, with the prevailing winds, for a few vessels drawing not over 17 feet (5.2 m.), but, being exposed to the south and west, it is not secure in the hurricane season. Vessels of larger draft will find temporary anchorage under the southwestern side of the island, between the Syndare Islets and the western end.

**Dangers.**—A shoal, with a least depth of  $19\frac{1}{2}$  feet (5.9 m.) and having a maximum diameter within the  $5\frac{1}{2}$ -fathom (10.1 m.) curve of 22 yards, lies in the approach to Port Gustavia. This shoal is about 725 yards eastward of Sugarloaf and 900 yards southwestward of the Whale.

**La Baleine (Whale Rock)** is a small, dangerous rock, awash and steep-to, lying about 400 yards westward of the Syndare Islets. Fifty yards south of it is a  $3\frac{1}{2}$ -fathom (6.4 m.) patch.

**Syndare Islets** are two islets lying north and south of each other, are barren, rugged, and separated by a coral ledge about 100 yards long; the northern islet is 98 feet (29.9 m.) high, and a ledge extends for about 225 feet from its northern and eastern sides and is not easily seen except when the sun is shining; a ledge also runs out 100 yards from the southeastern end of the southern islet, and upon it are two small, rocky islets; the outer one rises from the edge of the ledge and is bold and steep-to.

**Les Saintes** are three small, low, rocky islets, about 400 yards from the shore; outside they are bold and steep-to, but inshore a ledge extends toward Fort Oscar Bluff, leaving a passage not 100 yards wide.

**A shoal**, about 150 yards in diameter, with a depth of 3 fathoms (5.5 m.) lies in the fairway midway between the northern Syndare and Fort Gustave.

**Channels.**—There are three entrance channels to the port: The west channel 700 yards wide between the Syndare Islets and the shore, with a least depth of 6 fathoms (11.0 m.); the south channel, 400 yards wide, between the Saintes and the Syndare Islets, with a depth of 6 fathoms (11.0 m.) and the southeast channel, between the Saintes and the shore, 100 yards wide with a depth of  $3\frac{1}{4}$  fathoms (5.9 m.). This latter channel should not ordinarily be used.

**A pilot** is always at hand.

**Directions.**—Vessels bound to Gustavia from the eastward, or intending to proceed to the southward of St. Bartholomew, should not bring the eastern end of the island to bear  $358^{\circ}$  before they have opened out the Sugarloaf to the southward of Negre Point, to avoid the Roques. Steamers may then stand into the harbor by the south or west channels, anchoring according to draft.

**Sailing vessels.**—With the prevailing wind the South Channel is the easiest to enter. In taking this channel pass close westward of the Saintes and anchor according to draft.

Should the wind be at east, if well maneuvered, the vessel may fetch into a berth. Should it be northward of east it becomes so variable and unsteady and rushes down with such violence that the greatest attention is requisite to keep the vessel well under command to insure staying. If the Syndare Islets are weathered, she may stand boldly toward the shore as far as is necessary to enable her to fetch into a berth, according to her draft. If not, there is room to make a short tack to the eastward, but a stranger without a pilot had better avoid this risk by using the West Channel.

In taking the West Channel, if coming from the eastward, the vessel may pass either outside the Sugarloaf or between it and the Syndare Islets; if the latter route is taken, haul close round the western side of LaBaleine and tack when necessary under the shore, which is free of danger. There is a clear and deep channel between Whale Rock and the Syndare Islets, but the wind is so uncertain that it will be better to pass outside.

**GUSTAVIA** ( $17^{\circ} 54' N.$ ,  $62^{\circ} 51' W.$ ; *H. O. Chart 371a*) is the seat of government and a free port; it is administered by a resident representing the Governor of Guadeloupe.

Port charges and port captain's fees are moderate.

**Coco**, the southernmost of the islets off the southeastern side of St. Bartholomew, lies south, about  $\frac{1}{2}$  mile from the bold, high bluff which forms the eastern side of Grande Saline Bay. It is a narrow, rocky islet, slightly wooded on its summit, and has a small rock nearly connected to its northern end; the islet is steep-to on all sides, particularly at its southern end, but it is not advisable to pass inshore of it.

**Grande Saline Bay**, to the northwestward of Coco Islet, affords temporary anchorage for small vessels. At the head of this bay are great salt marshes, the working of which has been partially abandoned. Thence to the southwestward of St. Bartholomew the shore is bold and steep-to, and there is no danger but that described.

**Roques**, or Little Turtle Rocks, are two very small rocky heads lying close together, about 1,500 yards to the eastward of Coco Island. They are only 3 or 4 feet (0.9 or 1.2 m.) above the sea, and although bold and steep-to are dangerous in the night, being nearly

1½ miles offshore. Inshore of them is the Fournis Reef, with a deep channel between, but it will always be better to pass to the south-eastward of them.

**Tortue** is a small flat-topped rocky islet lying 1,500 yards north-westward from the northeastern point of the island, to which it is connected by a ledge of rocks, dry in places. A quarter of a mile to the northeastward of this islet are the Grenadiers, a small, rocky ledge only 2 or 3 feet (0.6 or 0.9 m.) above water, on which the sea breaks heavily; it is steep-to on the northeastern side.

**Toc Vers** is a small, pointed, rocky islet. When seen from the east or west its northern pillar resembles a lofty pillar standing close by the side of the perpendicular cliff, which is about 120 feet (36.6 m.) high and very remarkable. It is steep-to on its northern and eastern sides.

**Fregatte and Goat Islands** are of considerable elevation, clothed with grass and low brushwood, and readily distinguished. The latter is separated from the northwestern end of St. Bartholomew by a clear channel ¼ mile wide, but the sea is generally so heavy that it should not be attempted except in a case of necessity.

**SABA ISLAND** (17° 38' N., 63° 14' W.; *H. O. Chart 1011*) is a Dutch possession; it rises 2,887 feet (880.0 m.) perpendicularly from the sea, but its summit is generally in the clouds. It is nearly round in form, 2¼ miles in diameter, bold and steep-to. The 100-fathom (182.9 m.) curve is about ½ mile from its western side and only 600 yards from its eastern side. The island is a mass of rugged mountains, with deep and precipitous ravines, through and over which are only footpaths from house to house. (See view 7, Appendix V.)

**Diamond Rock**, 80 feet (24.4 m.) high, is situated 500 yards northwestward of the northwest point of the island. It is steep-to on all sides except the southeast, where 200 yards southeast of Diamond Rock is a 2-fathom (3.7 m.) spot.

**Pilot Rock**, 6 feet (1.8 m.) high, is a small rock, close to the northwest point.

**Green Island**, 40 feet (12.2 m.) high, is very close to the north side of the island.

**Southside Landing**, the principal landing place, is about 800 yards eastward of Ladder Point and is merely a little rocky cove on the coast at the foot of a deep ravine, through which a pathway leads up to the village.

There is another landing about 1,500 yards northward of Ladder Point, called Ladder Landing, from its being at the foot of a pathway traced out of the rugged precipice, which rises almost perpen-

dicularly out of the sea. In general, a heavy surf breaks all along the shore and renders landing extremely difficult and often dangerous.

**Torrens Point Landing.**—A landing may be effected with the prevailing winds, when moderate, about  $\frac{1}{3}$  mile to the southward of Torrens Point, the northwestern extremity of Saba.

**Anchorage.**—The anchorages off Saba are neither commodious nor particularly safe.

Small sailing vessels or steamers may anchor temporarily off the Southside Landing. Another anchorage, where the bank of soundings is somewhat wider, is on the western side of the island, between Ladder Landing and Torrens Point. Here a vessel may anchor in 12 or 15 fathoms (21.9 to 27.4 m.), sandy bottom, about 400 yards offshore, with the outer part of Torrens Point bearing  $21^{\circ}$ .

**Caution.**—Sailing vessels should not attempt to anchor at Saba except in case of necessity, as the wind under the high land is almost invariably baffling and flawy.

**Directions.**—Should necessity compel a sailing vessel to take this anchorage, it had better be approached from the northward. After rounding Diamond Rock, approach the anchorage under easy sail. When the northern point of Saba is shut in with Torrens Point, and just before Pilot Rock comes on with the western peak of the island of St. Martin, bearing  $21^{\circ}$ , a vessel may anchor in 12 or 15 fathoms (21.9 to 27.4 m.), sandy bottom, about 400 yards offshore.

The bank here is very steep, and it will be prudent to lay out a kedge with a stout hawser to the westward to prevent the vessel from being swung inshore by the eddying gusts from the mountains, and which will be found convenient to haul off by when getting under way.

**THE BOTTOMS** is the principal village of Saba Island and the residence of the administrator, 960 feet (292.6 m.) above the sea, and is only visible when Ladder Point, the southwestern point of the island, bears  $347^{\circ}$ . The only commerce is in poultry and vegetables. The islanders speak the English language and are excellent shipbuilders, and their boats and small craft are famed all over the Windward Islands.

The population was 1,599 in 1926, with a fair percentage of white.

**Supplies.**—There is a well near Torrens Point where vessels may obtain a supply of water, which, although drinkable, is not good. Obtaining the water will be attended with great difficulty and risk. Firewood can be purchased, but it is necessary to bespeak it and agree to have it brought down to one of the landings.

**Saba Bank** forms nearly a parallelogram, its longest sides lying east-northeast and west-southwest, about 32 miles, and its shortest about northwest by north and southeast by south, 20 miles. Its nearest part is  $2\frac{3}{4}$  miles southwest of Saba Island.

The eastern edge of Saba Bank is fringed with a remarkable narrow ledge of live coral, sand, and rock, which is nearly 30 miles in length, varying in depth from 6 to 10 fathoms (11.0 to 18.3 m.); when on this part the bottom is distinctly seen. It commences about 4 miles southwest from Saba Island, and trends thence to the south-

southwest for 11 miles, with a breadth of from  $1\frac{1}{2}$  to  $2\frac{1}{2}$  miles; it then turns south-southwest for 8 miles, and is from 1 to 2 miles broad, and terminates 12 miles farther west by south, where it is merely a ridge of 9 fathoms (16.5 m.) not  $\frac{1}{2}$  mile broad. To the westward, within this ledge, with the exception of a few small coral patches of 9 and 10 fathoms (16.5 and 18.3 m.) toward the southern edge, the bottom is clear white coral sand, with a depth of from 12 to 15 and 20 fathoms (21.9 to 27.4 and 36.6 m.), gradually increasing to the edge, but terminating abruptly in 30 fathoms (54.9 m.). The bottom can be distinctly seen under a depth of 10 fathoms (18.3 m.).

A depth of 8 fathoms (14.6 m.) has been found on this bank, from which Saba Island summit bears about  $63^\circ$ , 15 miles distant. Other soundings of 10 to 11 fathoms (18.3 to 20.1 m.) were found close to the above position.

On the northern edge of the bank there is excellent fishing ground; but the Saba fishermen have frequently found the barracouta, caught here and on the bank between St. Christopher and St. Eustatius, poisonous.

**Tides.**—There appears to be no tide on Saba Bank, and very little current was observed during the survey, which was made in the winter months.

**ST. EUSTATIUS ISLAND** ( $17^\circ 30' N.$ ,  $63^\circ 58' W.$ ; *H. O. Chart 1011*) generally called Statia by the inhabitants, belonging to the Dutch, is lofty and volcanic; its summit, like that of Saba, is generally hidden by clouds. The island, when seen from the northeastward or southwestward, at a distance appears like two distinct islands. On the northern part are ragged hills from 500 to 960 feet (152.4 to 292.6 m.) high; the southern portion is occupied by a volcanic mountain, 1,950 feet (594.4 m.) high, but the summit is seldom visible, on the southern side of which is a bold white cliff, called the White Wall. The island has been a Dutch colony, with but little interruption, since the year 1600 and is now a part of the Dutch West Indies under the governor at Curacao.

The population of the island in 1926 was 1048.

**Coast.**—The northern part of St. Eustatius is bold, and with the exception of a rock awash 300 yards from the southwest point, may be rounded at the distance of 200 yards, but breakers extend from the southeastern side, and sailing vessels in coming from either quarter it will do better to keep  $\frac{1}{2}$  mile from the shore to avoid the baffling winds under the high land. See view 15, Appendix V.)

**Orange Town (Oranjested)** (*see plan on H. O. Chart 1011*), the only town on the island, is on the western shore, partly on the beach and partly on the cliff above it, 130 feet (39.6 m.) high. The two parts, called the lower and upper town, are connected by a road cut in



the face of the cliff. Fort Orange stands on a cliff in front of the town.

The only safe landing place is on the beach abreast of the town, and here the surf is frequently so heavy that the boat must be veered in with a long line from a grapnel.

**Orange Town Light**, fixed white, visible 2 miles, is exhibited from the roof of the port office, near the landing, 219 yards 297° from the center of Fort Orange. (See Light List.)

**Anchorage.**—In approaching the anchorage the only danger to be avoided is a rock, nearly awash, at the southwestern end of the island, between the White Wall and the town.

The best anchorage is 700 yards from the shore, in 10 fathoms (18.3 m.) sand, with the church and Round Hill in range 72°, and the southwestern extremity of the island in range with Brimstone Hill (St. Christopher) 132°.

**The wind** hardly ever varies to the northward of northeast or to the southward of east.

This island, with St. Christopher and Nevis, may be considered as a separate cluster, as they rise from a bank of soundings separated from the adjacent islands by channels of a greater depth than 200 fathoms (365.8 m.).

**ST. CHRISTOPHER ISLAND**, generally called St. Kitts, is an English colony, and, with the islands of Nevis and Anguilla, forms the presidency of St. Christopher and Nevis. The climate of the island, for a tropical one, is healthy.

The island is of volcanic origin, the very remarkable peak of Mount Misery (generally in the clouds) rising to the height of 4,319 feet (1,316.4 m.). (See view 33, Appendix V.) It is nearly 18 miles in length, but so irregular in form as to vary considerably in breadth; it possesses no harbor and but indifferent roadsteads, quite unsafe in the hurricane season. At about 4 miles from its southeastern end it is nearly divided into two parts, being connected by a low neck of sand not  $\frac{1}{4}$  mile across, and consequently at only a short distance it appears as two islands, and at a greater distance from the eastward or westward the irregular hills at the southeastern end will appear as several detached islets.

The northwestern end of the island is about 5 miles broad, and the center part is occupied by a vast rugged mountain ridge, its lofty summit terminating in Mount Misery. At the southeastern end of the ridge, at the back of the town of Basse Terre, is a striking elevation called Great Monkey Hill, its rounded wooded summit being 1,319 feet (402.0 m.) high, and at the foot of the western side of the mountain close to the shore is Brimstone Hill, 779 feet (237.4 m.)

high, equally conspicuous, and easily distinguished by the extensive fortifications and signal staff which crown its summit.

The southern end of the island, although much less elevated, has some very remarkable hills which, as they are always visible, are very useful as landmarks when navigating between the islands.

St. Anthony Peaks are two massive hills, which form the extreme southeastern end, the loftiest being 1,188 feet (362.1 m.) high; the Nags Head, 548 feet (167.0 m.) high, at the southern point of the island; and the Sugarloaf, 616 feet (187.8 m.) high, midway between the above, are all well-defined objects. The valleys which separate them are so low that from a distance in certain positions these hills appear as small islets, as before mentioned.

The edge of soundings is distant only from  $\frac{1}{2}$  to  $2\frac{1}{2}$  miles from the shores of the island; the northeast shore is here and there skirted by a reef, which in places affords temporary shelter for boats and droghers. The bank which connects this island to St. Eustatius is from 4 to 6 miles broad, with a depth of from 15 to 25 fathoms (27.4 to 45.7 m.) over coral sand and rock.

The population of the island in 1918 was estimated to be 27,047.

**Caution—Sailing vessels.**—In passing to eastward of the island it will be prudent not to come within the distance of 3 miles until the vessel is to the southward of the highland, to avoid being becalmed or exposed to the violent gusts which rush down unexpectedly through the ravines, and which she should be well prepared to meet.

In rounding the northern end of St. Christopher in the night, to the westward, great caution must be observed not to come within the depth of 15 fathoms (27.4 m.). Deep Bay Point the northeastern point of St. Christopher, is foul for some distance and very low; and being backed by high land, any estimated distance from it will be exceedingly doubtful.

In passing between St. Christopher and St. Eustatius—unless the wind is well to the northward of east—it will always be better to give the former a wide berth in order to keep the breeze. A vessel well seldom meet with any adverse current here, and she will have no difficulty in beating up to Basse Terre.

Steamers of deep draft passing to the eastward of the island should keep outside of the 10 fathom (18.3 m.) curve to avoid the many shoals along the eastern coast of St. Christopher.

**BASSE TERRE ROADS** ( $17^{\circ} 18' N.$ ,  $62^{\circ} 43' W.$ ; *plan H. O. Chart 1011*) is a shallow open bay nearly  $1\frac{1}{2}$  miles long and  $\frac{1}{2}$  mile wide located on the southwestern side of the island of St. Christopher.

At the head of the bay is the City of Basse Terre, the capital of the Presidency of St. Christopher and Nevis. The bay is open to winds from the south of east which would raise considerable sea.

**Depths.**—There are depths of 20 feet (6.4 m.), 400 yards, and 30 feet (9.1 m.) 800 yards off the pier. A shoal with 5 feet (1.5 m.) makes out 100 yards from the end of the pier.

**Aspect.**—The treasury building near the pier is a red building with white trimmings and has a red dome. Other prominent and conspicuous objects in approaching the anchorage are: The wharf of the St. Kitt's sugar factory on the eastern shore, two black chimneys of a sugar factory, northward of the town the flagstaff on the Old Fort and St. George's Church, behind the Treasury Building. (See view 11, Appendix V.)

**Basse Terre Harbor Lights.**—A fixed red light, 57 feet (17.4 m.) above high water, visible 4 miles, is shown from the lantern of the dome of the new treasury buildings at Basse Terre. Two fixed white lights are shown from iron poles at the end of the eastern, and two red fixed lights from similar poles at the end of the western pier. These pier lights are visible for about 3 miles. (See Light List.)

**Anchorage.**—The best anchorage is off the center of the town in 8 or 9 fathoms (14.6 to 16.5 m.) of water, with the flagstaff of Old Fort, at the western end of the bay, bearing west-northwest. This anchorage is slightly close for large deep-draft vessels. A good anchorage for small vessels may be found in from 5 to 6 fathoms (9.1 to 11.0 m.) with the light on the treasury building bearing north, distant 700 yards. The anchorage is sheltered from northeast trade, but at any time during the year southerly gales may occur and render it untenable for small vessels. When the wind is from the south of east, the anchorage is very disagreeable, as the ship will ride across the sea, and should the wind freshen precautions should be taken to prevent seas being shipped aboard.

**Storm signals** are shown at Basse Terre, St. Christopher. In event a hurricane is reported as coming in the direction of St. Christopher, the hurricane warning, consisting of two red flags with black centers will be flown on the signal flagstaff at Fort Thomas on the western side of the town. As soon as explicit information to that effect is received, the same signal will be flown on the Government flagstaff on the Bay Front.

The United States Weather Bureau maintains a representative at St. Christopher.

**Pilots.**—No pilot is necessary as it is an open roadstead. If going to other anchorages on either St. Christopher or Nevis it might be advisable to take a pilot, who can be obtained at Basse Terre.

**Directions.**—No directions are necessary, for there is no danger whatever, but vessels of large draft when approaching the anchorage from Charlestown (Nevis) must be careful to avoid Monkey Shoals.

Approaching from the southward, St. Eustatius open to the westward of Brimstone 325°, clears all the shoals west of Nevis. (See view 25, Appendix V.)

**BASSE TERRE** (17° 18' N., 62° 43' W.; *Plan H. O. Chart 1011*), the capital of the presidency of St. Christopher and Nevis, is the residence of the administrator. The town is clean and healthful. In 1914 the population was 9,019.

**Piers.**—There are two wooden piers about 170 feet in length, with depth of 8 feet (2.4 m.) at the ends, used for landing passengers and the handling of light freight. The eastern pier has a 5-ton crane. The western pier has two 1-ton cranes. At the sugar factory, 1 mile eastward of the city, there is a concrete pier where all heavy shipments are handled. Here there is a 13-ton crane and two 2½-ton cranes. All cargo is handled from ship to shore by means of sailing lighters.

**Repairs.**—There are no facilities for making repairs.

**Supplies.**—There is only sufficient coal on the island for local needs. There is no fuel oil. There is a water pipe line to the end of the government pier. Water may be obtained by application to the harbor master. This is free if taken off in ship's boats, but must be paid for if delivered alongside. Water should not be used for drinking purposes unless boiled or distilled. There are no ship or engineer stores available.

Fresh provisions and ice are obtainable in limited quantities.

**Communications.**—The cable from St. Thomas to St. Christopher, and from St. Christopher to Antigua, lands at a cable house on the northeastern base of the hill facing Frigate Bay. A land line runs from the cable house to the telegraph office in Basse Terre. Telegrams can be sent to all parts of the world. There is a telephone system in the island. The Quebec Steamship Co., between New York and British Guiana, calls every 10 days each way. The Royal Mail Steam Packet Co., between Canada and British Guiana, calls every two weeks each way.

**Sanitary conditions, climate.**—The climate of Basse Terre, for a tropical town, is exceptionally healthy. Except during the hot season, the climate is not too warm for comfort. Malaria fever is prevalent and there is a large amount of syphilis.

**Hospitals.**—The Cunningham Hospital, of 75 beds, is the best hospital. Seamen from vessels will be admitted and a small charge is made. There is a leper hospital at the northern end of the island.

**Old Road** lies about 5 miles westward of Basse Terre, and a little eastward of the town there is a temporary anchorage in 9 or 10 fathoms (16.5 to 18.3 m.) of water, stony bottom, at 200 yards from the shore, abreast a river of excellent water.

This anchorage should not be taken by a sailing vessel, except in a case of emergency, for the wind under the highland is so baffling and uncertain as to make it no easy matter to get away from the shore.

**Sandy Point Anchorage.**—In the northwest part of the island, about 1¼ miles northwestward of Brimstone Hill is an anchorage for vessels loading sugar.

The best anchorage is in a depth of from 5 to 6 fathoms (9.1 to 11.0 m.), sand, with the old mill close northeastward of the pier bearing 58°.

No special directions are necessary, as there are no dangers, but vessels should approach with caution, as the bank is steep-to, and the water shoals rapidly between the 10 and 3 fathoms (18.3 and 5.5 m.) curves.

**Pier.**—A pier 200 feet in length extends off the northwestern end of the village, with a depth alongside its outer end of 8 feet (2.4 m.).

**Light.**—A light is exhibited from the end of the pier.

**Wind.**—The wind generally is from northeast through east to southeast, but under the highland is very baffling and uncertain. Sudden squalls of wind and rain are of frequent occurrence.

**Sandy Point Village.**—A village about  $1\frac{1}{4}$  miles northwestward of Brimstone Hill, is a loading place for sugar, and in 1926 had a population of about 1,000, who are almost entirely dependent on the sugar industry. The village is connected by a road with Basse Terre; a light railway has nearly been completed (1925) for the transport of sugar cane to Basse Terre. Small quantities of provisions may be obtained locally, but generally provisions can only be obtained at Basse Terre.

**Deep Bay.**—The northern end of the island has a reef about  $1\frac{1}{4}$  miles long protecting the anchorage. The outer edge of the reef lies about 1,500 yards offshore, with shallow water a short distance outside of it. Deep Bay affords good anchorage for coasters. This part of the island should, on account of the reef, not be approached with 2 miles. The western entrance, which is not used, is foul and carries only 7 feet (2.1 m.) of water; the eastern entrance is little used, as it faces the northeast trades and is close to shore.

**THE NARROWS** ( $17^{\circ} 14' N.$ ,  $62^{\circ} 35' W.$ ; *H. O. Chart 1011*) is the name given to the channel between Windy Hill on Nevis Island and the headland named Scotch Bonnet on St. Christopher Island. It is there  $1\frac{2}{3}$  miles wide, and navigable either way for steamers drawing 18 feet (5.5 m.). But it is only available for sailing vessels of this draft from the northeast; from the southwestward, against the prevailing winds, it can be only used safely by handy coasters, with the aid of local knowledge, for few tacking marks can be given.

**Booby Island**, 126 feet (38.4 m.) high, is a remarkable small conical island, and is 1 mile eastward of Scotch Bonnet.

**Cow Rocks**, a small cluster 6 feet (1.8 m.) high, lie nearly in the middle of The Narrows, and a mile southwest of Booby Island. Nearly halfway between the latter and Cow Rocks is a 3-fathom (5.5 m.) patch lying close south of the recommended ship's track. Cow Rocks are joined to the point under Windy Hill (Nevis Island) by a broad bank, with 12 to 16 feet (3.7 to 4.8 m.) of water over it.

Depths of  $3\frac{1}{4}$  fathoms (5.9 m.) will be found half a mile northwest, 1 mile west-northwest, and 800 yards southwest of Cow Rocks, the two patches first mentioned almost joining the bank extending

half a mile southwest from Scotch Bonnet. From the north coast of Nevis Island shallow reefs stretch off half a mile.

**A bank** with 2 fathoms (3.7 m.) on it lies from 2,200 to 2,800 yards southeast of Booby Island.

**A patch** with 16 feet (4.8 m.) on it lies three-quarters of a mile north of the same island and east of the recommended ship's track.

**A bank**, some parts of which are nearly awash, is  $1\frac{1}{3}$  miles long in a northwest direction, the latter extreme being situated  $1\frac{1}{4}$  miles northeastward of Booby Island. This bank is almost connected to the northeast part of Nevis Island by depths under  $3\frac{1}{4}$  fathoms (5.9 m.).

Over the above irregular depths there is a narrow channel of 4 fathoms (7.3 m.) to or from the southeast, suitable for coasting vessels. The range for this channel is to keep Sugar Loaf in range with the northeast side of Booby Island bearing  $286^{\circ}$ .

**Mosquito Bluff**, the southeast extremity of St. Christopher Island, is a small perpendicular cliff, 90 feet high (27.4 m.), lying at the base of two high hills known as St. Anthony Peaks, 1,124 and 1,188 feet (342.3 to 362.1 m.) high, the northwestern one being used as a clearing mark for Monkey Shoals. Mosquito Bluff is useful in passing through the Narrows.

**A shoal** with  $2\frac{1}{4}$  fathoms (4.1 m.) lies  $1\frac{1}{3}$  miles northeastward of Mosquito Bluff.

**Anchorage.**—There is excellent anchorage in the Narrows, with good holding ground in 6 fathoms (11.0 m.) of water, with Cow Rocks bearing  $68^{\circ}$ , Scotch Bonnet Head  $24^{\circ}$ , and Horseshoe Point  $284^{\circ}$ .

**Directions.**—The passage is between shoals, on which the sea breaks in several places, and as the soundings give no warning it is necessary to approach cautiously. For this purpose a vessel should keep an offing of at least 3 or 4 miles, and steer in with Nags Head, a remarkable peaked hill, in range with Mosquito Bluff  $233^{\circ}$ ; when Lowland Church is just open to westward of Booby Island  $194^{\circ}$ , a vessel will be on the bar between the shoals, in 28 feet (8.5 m.) least water. Having crossed the bar, run direct for Booby Island; pass 400 yards westward of it, and thence steer so as to pass to the north-westward of Cow Rocks at about the same distance; westward of them there is no danger.

**NEVIS ISLAND** ( $17^{\circ} 09' N.$ ,  $62^{\circ} 34' W.$ ; *H. O. Chart 1011*) is lofty and volcanic, somewhat circular, 7 miles in length,  $5\frac{3}{4}$  miles in breadth, and its area is about 20 square miles. Nevis Peak, with its crater, rises from the center of the island to the height of 3,596 feet (1,096.0 m.), but it is seldom visible. There are, however,

several other elevations which, being almost always unclouded, become most useful landmarks. On the southern side of the island Saddle Hill, 1,432 feet (436.5 m.) high, may be readily made out from its features, except from the east-southeast and west-north-west, when the hummocks appear as one. The hill, however, from these points is equally conspicuous. On the eastern side of the island are two remarkable wooded peaks, standing on a fork of the mountain, 2,350 feet (716.3 m.) high.

On the northwestern side, Hurricane Hill, 1,192 feet (363.3 m.) high, is easily recognized, being large and massive and terminating in a peak, and having at its base a small detached rounded hill, which forms a prominent bluff at the extreme northwestern end of the island, 288 feet (87.9 m.) high, called Windy Hill. With the exception of this point and the base of Saddle Hill, the shores are low, and rise gradually to the interior, the plains and slopes being highly cultivated.

The island is an English colony and belongs to the presidency of St. Christopher and Nevis. Population, 12,945 in 1911.

**Charlestown Roadstead** affords excellent anchorage in from 6 to 10 fathoms (11.0 to 18.3 m.) on a shelf about  $\frac{3}{4}$  mile square, sheltered from the normally prevailing northeast winds.

**Pier.**—There is a pier which has a depth of 11 feet (3.4 m.) alongside for 50 feet of its length, and has landing steps on both sides of the head.

**Light.**—A fixed red light is exhibited at an elevation of 15 feet (4.8 m.), from a post situated at the outer end of the pier.

**Pilots.**—There are no regular pilots and pilotage is unnecessary.

**Directions.**—Except on the western side, between Fort Charles and Cades Point, the shore is fringed with a coral reef, and should not be approached within 1,500 yards, or the depth of 10 fathoms (18.3 m.).

In approaching the anchorage off Charlestown from the southward by night the lead must be quickly tended, as the 10-fathom (18.3 m.) curve is less than 1 mile offshore and steep-to.

In the daytime, having rounded the southern end of Nevis, keep the whole of Frigate Bay Hill, 658 feet (200.6 m.) high, well open of Rock Point bearing 350°.

When Booby Island comes well open of the northern side of Nevis bearing 21° head for it. This mark will lead just outside the ledge off Fort Charles and to an anchorage at about  $\frac{1}{2}$  mile offshore, in 6 fathoms (11.0 m.) of water, abreast the flagstaff in the town.

**Caution.**—There is a possibility that shoal water extends farther from Fort Charles than the chart shows, as the steamship *Byron*, drawing 20 feet (6.1 m.), reported an obstruction  $1\frac{1}{2}$  miles 198° from Fort Charles.

**CHARLESTOWN** ( $17^{\circ} 08' N.$ ,  $62^{\circ} 37' W.$ ), the capital of the island, is a small town of about 1,000 inhabitants. There are no fueling or provisioning facilities. There is a small hospital.

**Monkey Shoals.**—Vessels of large draft approaching the anchorage off Charlestown from the northwest must avoid Monkey Shoals, which are the only dangers on this side of Nevis, and lie  $314^{\circ} 4\frac{1}{2}$  miles from Fort Charles.

These shoals form two small banks of coral and sand, on which there is 4 fathoms (7.3 m.) of water; they lie on the edge of soundings and occupy a space about  $\frac{1}{2}$  mile long, are 400 yards broad, and the discolored water over them may be seen at some distance from aloft.

Lloyd's staff at Charlestown in range with Prospect Hill Mill (which stands on the top of the western ridge of low hills),  $130^{\circ}$ , leads to the southwestward; and the eastern extremity of Horseshoe Point in range with St. Anthony western peak  $28^{\circ}$ , leads to the eastward.

Paradise Mill, Nevis, in range with the old mill on Tower Hill, bearing  $99^{\circ}$  (the latter stands well up on the side of the mountain) leads close southward of them; Cades Bay Mill (the northwesternmost on the shore), in range with Spring Hill Mill (which stands conspicuously on the ridge connecting Hurricane Hill with the mountain),  $99^{\circ}$ , leads to the northward.

St. Eustatius open of Brimstone Hill  $325^{\circ}$  leads westward of all the shoals westward of Nevis. (See view 25, Appendix V.)

**REDONDA ISLET** ( $16^{\circ} 55' N.$ ,  $62^{\circ} 19' W.$ ; *H. O. Chart 1011*) is small and rocky,  $1\frac{1}{4}$  miles long, about 1,500 yards broad, and 1,000 feet (304.8 m.) high, about 17 miles from Nevis. It is uninhabited. The prevailing winds are from the east-southeast. The only landing is at a small pier at the south end of the islet. Pinnacle Rock is a small remarkable detached rock off the southeastern end. (See view 10, Appendix V.)

**Anchorage** is good in from 18 to 20 fathoms (32.9 to 36.6 m.), sand, with the pier bearing southeast, distant 600 yards. There is a crane on the pier.

**Bank.**—From about 3 miles north-northwestward of Redonda a coral bank extends for about 7 miles in a northerly direction; the least water on it is 21 fathoms (38.4 m.)

**MONTSERRAT ISLAND** ( $16^{\circ} 44' N.$ ,  $63^{\circ} 11' W.$ ; *H. O. Chart 1011*), discovered by Columbus during his second voyage, was named by him from its resemblance to the mountain of the same name near Barcelona, which is rugged, uneven, and exhibits many lofty peaks, as its name in the Spanish language implies. The first settlement



on the island was formed by the English in 1632 and is now a presidency, forming part of the colony of the Leeward Islands. The island is of volcanic origin, 9 miles long, north and south, and 5 miles broad, and its lofty heights, clothed with wood to their summits, may, when unclouded, be seen at distance of about 45 miles; the highest is Soufriere Hill, 3,002 feet (915.0 m.) high. Its shores are bold, steep, and free of danger. Its east and northwest sides are precipitous, but the southeast and west sides slope gradually to the sea and are highly cultivated. (See views 8 and 9, Appendix V.)

The bank of soundings under 10 fathoms (18.3 m.) extends from the south side of the island about  $\frac{1}{4}$  mile, increasing in extent toward the east and west coast.

**Climate.**—The climate of the island is healthful; average annual rainfall is about 56 inches in the lowlands and 78 inches at elevations above 1,000 feet (304.8 m.). (See Meteorological Tables, Appendix IV.)

**Tides.**—It is high water, full and change, at Montserrat at 6h. 00m. approx.; springs rise  $1\frac{1}{2}$  feet (0.5 m.), neaps rise about half a foot (0.2 m.), but they are irregular. Off the north and south extremes the rate of the western stream at times is 2 knots, the eastern being weak; along its other coasts the rate is about half a knot.

**Water.**—Many springs of excellent water flow into the sea, but on account of the surf watering is attended with difficulty.

**Population.**—In 1921 the population of the island was 12,120. It is attached to the government of the Leeward Islands.

**PLYMOUTH ANCHORAGE** ( $16^{\circ} 42' N.$ ,  $62^{\circ} 13' W.$ ; *Plan on H. O. Chart 1011*).—The best anchorage on the island is slightly northeast of Plymouth. This anchorage is sheltered from the northeast winds, but is fully exposed to winds from all other directions. Usually a swell is experienced, the size of which depends on the strength and direction of the wind.

**Landmarks.**—A war memorial situated about 40 yards northward of the pier is very conspicuous, being of white stone about 20 feet (6.1 m.) in height and like a clock tower in appearance. There is a mill slightly above and to the southward of the charted inconspicuous watermill northward of the town.

A steel radio tower 150 feet (45.7 m.) high has been erected 500 yards eastward of the pier.

**Plymouth Harbor Lights.**—A fixed white light, elevated 32 feet (9.8 m.) above high water, and visible 10 miles, is exhibited from a red 25-foot (7.6 m.) mast at the base of the jetty at Plymouth. It was reported unreliable in 1922. A fixed red light, elevated 26 feet (7.9 m.) above high water, is shown from the end of the jetty.

**Anchorage.**—The shore immediately abreast the town is steep-to, there being 10 fathoms (18.3 m.) a little more than 200 yards from the beach and deepening quickly to 20 fathoms (36.6 m.) so that for a large vessel a better berth will be found northwestward of the town in 9 fathoms (16.5 m.) about  $\frac{1}{2}$  mile from shore, with Bransby Point in range with Redonda Island. (See view 12, Appendix V.)

Landing is difficult from the heavy surf on the beach even in the finest weather.

Small vessels may anchor anywhere off the western side of the island and in Fox, Old Road, and Cars Bays; there is no anchorage on the eastern side. During the hurricane months a vessel should put to sea immediately on the approach of bad weather.

**Storm signals.**—Cautionary signal: Two guns or other explosive signal will be fired in succession by day or by night from the Treasury; by day a red flag will be hoisted at the signal staff at St. Georges Hill Fort; by night, one rocket will be fired from St. Georges Hill Fort.

Danger signal: All the church bells will ring for 10 minutes. Three guns, or other explosive signal, will be fired in succession at the Treasury and two rockets will be fired at St. Georges Hill Fort by day or night.

**PLYMOUTH** ( $16^{\circ} 42' N.$ ,  $62^{\circ} 13' W.$ ; *H. O. Chart 1011*), the principal town, situated on the southwestern side of the island, is well built, and has a population of 1,730.

**Pier.**—There is a steel and concrete pier about 300 feet long, with depths of 11 feet (3.4 m.), with a 3-ton crane on its outer end. All cargo is handled from ship to shore by means of lighters.

**Supplies.**—There are no ship supplies available. Fresh provisions may be purchased in small quantities.

**Communication.**—Montserrat Island has steamship connection with England, Canada, Sweden, Bermuda, the West Indies, and Demerara.

**Radio.**—A radio station, call letters GOH, wave length 600 meters, has been established at Plymouth.

**AVES (BIRD) ISLAND** ( $15^{\circ} 42' N.$ ,  $63^{\circ} 38' W.$ ; *Plan on H. O. Chart 1011*) so called from the large number of sea birds which frequent it, is about  $\frac{3}{4}$  mile long in a north and south direction; 500 yards wide, and has a height of 18 feet (5.5 m.) above sea level. The island, which can normally be seen about 8 miles by day and about 2 miles by night, is of coral formation and is surrounded by a reef, except on its western side, where a landing may be made. The islet appears to rise from a bank of soundings of considerable extent, which has not been minutely examined, but which seems to be irregular in depth. Fishermen from St. Eustatius and other neighboring islands visit the island in March and April to gather sea birds' eggs, which are taken to St. Thomas and sold in large quantities. No fresh water is to be found.

The tide rises about 3 feet (0.9 m.); the flood runs northwestward.

**Anchorage** will be found with the middle of the islet bearing about northeast in depths of 10 fathoms (18.3 m.), with a bottom of sand and rock. Care should be taken to anchor on a sandy spot, which may be easily picked out by the eye. The fishermen who resort to Aves Islet state that the anchorage inshore, or within  $\frac{1}{2}$  mile of the landing place, is not good, and that when a ground swell sets in it breaks heavily. On account of this ground swell vessels are occasionally prevented from leaving the island for several days, and a detention of three weeks has occurred.

Landing is sometimes impracticable on account of rollers.

The sea birds usually visit the islet about the beginning of March, and the egg season ends at the same time as the fishing season.

There are no trees on the islet, and the vegetation is very scanty; the grass, however, is about 6 inches high. There is no appearance of guano now.

During the fishing season a schooner makes three voyages between Aves, St. Thomas, Saba, and St. Eustatius Island.

**BARBUDA ISLAND** ( $17^{\circ} 38' N.$ ,  $61^{\circ} 47' W.$ ; *H. O. Chart 1484*).—This island is  $13\frac{1}{2}$  miles in length, northwest and southeast, and  $7\frac{1}{2}$  miles in breadth, containing about 900 inhabitants, who are under the government of Antigua. It is but partially cultivated, being chiefly devoted to the rearing of cattle, sheep, horses, and deer; indeed, it may be termed the stock farm of Antigua. Cart harness and saddlery are also manufactured from the skin of the deer, which are bred almost solely for that purpose.

**Aspect.**—The northern, southern, and western sides of the island are low, sandy, and scantily wooded, with nothing remarkable on them, except on the southern side, where, about 2 miles from the southwestern point, there is an old martello tower in a ruinous state near the beach. The southern side of the martello tower, if still kept whitewashed, forms an object distinctly visible at sea from some distance under a favorable light.

**East coast.**—From Spanish Point, the southeastern end, the northern side of which is a white cliff 35 feet (10.7 m.) high, the eastern shore of the islands begins to rise, and about midway, over a space of 2 miles, it is composed of perpendicular cliffs 200 feet (61.0 m.) in height and is the highest part of the island. On this side a dry broken coral ledge shirts the shore at a distance of about half a mile, upon which the sea breaks with great violence; and it is so steep that there is no bottom with 90 fathoms (164.6 m.)  $1\frac{1}{2}$  miles outside it.

**North coast—Reef.**—A reef extends nearly  $1\frac{1}{2}$  miles off the northern shore, and is also so steep that the depth is 30 fathoms (54.9

m.) within 1 mile of it; the extreme northern point of the reef, however, always shows itself. At the northwestern end of the island the ledge is composed of detached coral heads, which extend out in that direction  $2\frac{1}{2}$  miles and do not break; here, however, the soundings give warning of approach, and a vessel in the nighttime, when passing the western side of the island, should not come within the depth of 10 fathoms (18.3 m.).

In passing north of Barbuda it should be carefully remembered that the low northern end, with its outlying reefs, extends fully 7 miles north of the Highlands, which will first be sighted and without caution might be mistaken for the northern end of the island.

**West coast.**—The western side is formed by a low, narrow sand ridge, scantily wooded, at the back of which is a lagoon some 6 miles in length having from 5 to 12 feet (1.5 to 3.7 m.) of water, only separated from the sea by a narrow strip of land. The entrance lies a short distance to the eastward of Billy Point, at the northwestern end of the island, but it is obstructed by a bar of mud with about 2 feet (0.6 m.) of water on it.

**The bank** of soundings on this side extends for a considerable distance to the westward, the 100-fathom (182.9 m.) curve being 14 miles from the island. This coast is foul in places for 2 miles offshore, but there are no known dangers outside the 5-fathom (9.1 m.) curve.

**South coast.**—The southern coast of the island is the most dangerous and must be approached with caution for the lead is of little use. During the night this coast should, if possible, be altogether avoided.

**Dangers.**—From Spanish Point, the southern extremity, a line of detached shoals extends nearly 7 miles in a southwesterly direction.

**Palaster Reef**, 2 miles from the point is nearly dry and always seen, but the other shoals with depths ranging from 1 to 3 fathoms (1.8 to 5.5 m.), seldom break. Under favorable circumstances, however, the discolored water on them may be seen a short distance off.

**Codrington Shoals.**—The outer of the westernmost shoals, named the Codrington, bears  $242^\circ$  from Spanish Point, distant  $6\frac{1}{2}$  miles. Between the Codrington and the Palaster is Dodington Bank, with patches of  $2\frac{1}{2}$  and 3 fathoms (4.6 to 5.5 m.).

The martello tower eastward of Palmetto Point bearing  $11^\circ$  or eastward of that bearing, leads westward of these dangers.

**Anchorage.**—There is good anchorage on the western side of Barbuda, with the prevailing winds, with Cedar Tree Point bearing  $12^\circ$ , and Palmetto Point, the southwestern extremity of the island,  $139^\circ$  in 6 fathoms (11.0 m.) of water, about 3 miles offshore.

Small vessels may approach much closer abreast Tuson Rock, which is 2 feet (0.6 m.) high, and lies a short distance from the beach, taking care to avoid the patch of  $1\frac{1}{4}$  fathoms (2.3 m.) about 1,600 yards southwestward of it.

There is also excellent anchorage on the southern side of the island, to the westward, and under the lee of the shoals, which shelter it with the wind as far to the southward as southeast. The best position for communicating with the island will be found about 1 mile from the shore, with the ruins of the old martello tower bearing  $11^\circ$ , and Palmetto Point  $302^\circ$ , in  $5\frac{1}{2}$  fathoms (10.1 m.). Be careful, however, when standing in, not to bring the fort to the northward of  $11^\circ$  until quite certain that the vessel is to the northward of the shoals. A bearing of the northern shoulder of Highland will be a useful guide for leading up to sight the martello tower.

**Landing.**—Both this and the anchorage on the western side of the island are exposed to the rollers, which prevail between the months of November and May; but as they take the vessel in the stern she is eased of the strain on her cable, and rides far more comfortably than at most of the anchorages about Antigua.

At this period, however, landing is attended with great difficulty and risk, for should the boat be thrown ashore broadside on the next wave would inevitably destroy her. From a short distance to the westward of the martello tower, before mentioned, as far as the southeastern end of the island, the beach is skirted by small coral heads, with deep water between, through which the way must be picked to the landing; the clearest spot will be found abreast the tower.

**Codrington village.**—Barbuda Island has but one settlement, Codrington village, situated on the east side of a lagoon, 6 miles in length, having 5 to 12 feet (1.5 to 3.7 m.) of water. In the village is the Anglican church, and in front of the village is a landing wharf. Supplies are scarce and expensive. Water is fairly plentiful, but is brackish and only fit for animals. Excellent tarpon and other sea fishing may be had; also good duck shooting. Deer abound, and wild pig, guinea fowl, pigeon, and ducks are plentiful. The shooting seasons are from January 1 to March 31, and July 1 to September 30. A guide is necessary for shooting.

**Caution.**—Navigators undertaking to pass between Barbuda and Antigua in the nighttime should be very sure of their latitude, as the soundings are so irregular that it would be difficult to tell from them which way to steer.

**ANTIGUA ISLAND** ( $17^\circ 00'$  to  $17^\circ 10'$  N., and  $62^\circ 40'$  to  $62^\circ 54'$  W.; *H. O. Chart 1004*) was discovered by Columbus on his second voyage in 1493, and named by him after a church in Seville, Santa Maria de la Antigua. It was first settled by the English in 1632, and with the exception of a short interval from 1666 to 1668, has ever since been an English colony.

**Bank of soundings.**—Antigua lies in the middle of the southern edge of an extensive bank of coral and sand, which extends a little northward of Barbuda on its northeastern edge.

**Shoal ground.**—On two different occasions  $7\frac{1}{4}$  fathoms (13.3 m.) have been found between latitudes  $17^{\circ} 04' N.$  and  $17^{\circ} 06' N.$  and longitudes  $62^{\circ} 01' W.$  and  $62^{\circ} 02' W.$

**Aspect.**—Antigua is 12 miles in length, east and west,  $9\frac{1}{2}$  miles in breadth, with a circumference of about 70 miles and an area of 108 square miles. The central portion of the island is flat; in the north there is a range of low, undulating limestone hills, with Mount Pleasant, 456 feet (139.0 m.), the highest, while the southern part is mountainous, culminating in Boggy Peak in the southwest, 1,330 feet (405.4 m.) high. The peaks of Antigua are seldom obscured.

The coast line is much indented and possesses numerous bays, harbors, and inlets, most of them being too shallow to admit any vessel except those of the lightest draft.

Almost the entire island is surrounded with dangerous reefs and shoals, the only space free from reefs being the south coast from Old Road Bluff to Willoughby Bay, where it is bold and steep-to. Elsewhere the coast should be approached cautiously and with the lead going constantly.

There is no river in the island and but few springs, consequently fresh water is scarce.

**Climate.**—The climate of Antigua is fairly healthy. During the winter months the temperature ranges from  $68^{\circ} F.$  to  $82^{\circ} F.$ , while during the remainder of the year the temperature rarely goes above  $90^{\circ} F.$  Droughts frequently occur and there is very little vegetation. The average annual rainfall is about 44 inches. (See Meteorological Tables, Appendix IV.)

**Wind.**—Like all other northern islands of the British West Indies, Antigua is in the hurricane belt and during the season, which lasts from July to October, is liable to be visited by these severe storms. Hurricane signals are displayed at St. Johns.

**Tides.**—The rise of tide at Antigua sometimes amounts to 2 feet (0.6 m.), but is generally less, and so uncertain in its periods as to be of little use to navigation.

**Current.**—During the period of the survey of these islands between November and May, little or no current was met with between Antigua and Barbuda Islands, although this is the period when the trade wind blows strongest. The connecting bank probably checks and deflects the current round Antigua and Barbuda Islands at the extremes of the bank. In June it has been found running strongly to the westward on the south side of Antigua, when at the

same time there was little or none on the north side, and an eddy stream close inshore.

**Population.**—The estimated population in 1926 was 29,648.

**Green Island** forms the eastern end of Antigua, the eastern extremity of which terminates in a bold, rocky headland, 170 feet (51.8 m.) high, called Man-of-war Point, which is steep-to and may be rounded at the distance of 1 mile. The sea generally rolls in so heavily that it should not be approached within this distance, and great caution should be observed when closing with Green Island either from the northward or southward.

**Tenpound Bay** is nearly  $\frac{1}{2}$  mile to the southwestward of Man-of-War Point, and is unnavigable from the heavy swell which always rolls in at the entrance. Ricket Harbor, at the southwestern end of the island, affords shelter for droghers under the lee of the reef.

**York Island** is a small rocky islet 170 feet (51.8 m.) high, about  $1\frac{1}{4}$  miles southwestward of Man-of-war Point, at the southern side of the southern entrance to Nonsuch Bay. Extending in a northeasterly direction for 1,200 yards across the southern entrance of Nonsuch Bay is York Bank with depths of  $3\frac{1}{4}$  to  $4\frac{1}{2}$  fathoms (6.4 to 8.2 m.)

This island is nearly connected by dry reefs to the shore of Antigua, which thence takes a southwesterly direction for  $1\frac{1}{2}$  miles, where it terminates in two bold, precipitous, rocky headlands 215 feet (65.5 m.) high, very remarkable from the eastward, especially when the morning sun shines on the white cliffs. In this space are the small bays of Marigalante, Exchange, and Halfmoon. The shore is skirted by a reef, but in moderate weather it may be approached to 1 mile.

From Hudson Point, the southernmost of the above headlands, the coast takes a sudden turn about west by north for about 3 miles, and then runs to the south-southeast for  $2\frac{1}{2}$  miles, forming a deep bight named Willoughby Bay.

**Willoughby Bay** is capable of affording safe anchorage to vessels in depths of  $3\frac{1}{2}$  to  $5\frac{1}{2}$  fathoms (6.4 to 10.1 m), but is so difficult and dangerous of access that it is seldom visited, the produce of this part of the country being sent by droghers to St. Johns. The north-side of the bay is a tableland 350 feet (106.7 m.) high, and its entrance is protected by a coral ledge, dry in many parts, through which there are two cuts, that to the northeast named Horseshoe Channel; the other is nearly 200 yards wide, but so crooked and intricate that no good marks can be given for its safe navigation.

**Directions.**—To enter Willoughby Bay by the Horseshoe Channel, run down about 1 mile off the reef, until Cochranes Mill, on the low land at the head of the bay, is in range with the low rocky point on the southern side of Christian Cove, bearing  $310^\circ$ , which mark

will lead through the narrow cut; on the point there is the ruin of a small fort, 40 feet (12.2 m.) above the sea, but it is scarcely visible. When Fort Shirley bears  $232^{\circ}$  the vessel will be within the reef, and may haul up gradually for the anchorage.

With the prevailing winds, vessels can not fetch out; and, as no safe directions can be given for the other channel, the anchorage in this bay is only free to steamers, and they will require the assistance of an experienced pilot. The bay is exposed to the full force of the sea, which makes it even dangerous to approach in strong winds.

**Shirley Heights** is a remarkable, bold, rocky promontory, rising almost perpendicularly to the height of 545 feet (166.1 m.), 4 miles to the southwest of Hudson Point. On the flat summit will be seen the barracks and other buildings, formerly the garrison, and at its western edge, a little more elevated, the two signal posts of Fort Shirley, which overlooks the entrance to English Harbor. Between Willoughby Bay and the heights are two small inlets, Mamora Bay and Indian Creek, which afford safe anchorage to droghers; the entrance to the former is obstructed by a bar with 10 feet (3.0 m.) of water on it; the mouth of the latter is about 200 yards wide, and has a shoal nearly in the center, on which the sea generally breaks.

**ENGLISH HARBOR** ( $17^{\circ} 00' N.$ ,  $61^{\circ} 46' W.$ ; *H. O. Chart 366*) is small and well sheltered and was formerly often visited by vessels of war, especially during the hurricane season, on account of its dockyard and the complete shelter which the harbor affords. The dockyard has, however, been dismantled.

**Depths.**—The navigable part of the entrance, whereon the entrance ranges, has a least depth of  $3\frac{1}{2}$  fathoms (6.4 m.). Inside the entrance there are depths of  $4\frac{1}{3}$  to  $4\frac{5}{6}$  fathoms (7.9 to 8.8 m.) up as far as the old navy yard and depths of  $3\frac{1}{3}$  fathoms (6.1 m.) off the wharf.

The harbor with depths of more than 3 fathoms (5.5 m.) is only 100 yards wide and is only available for very short ships.

The outer harbor, Freeman Bay, is easy to enter, and vessels can anchor in 4 fathoms (7.3 m.), but because of lack of swinging room vessels of 18 feet (5.5 m.) must moor bow and stern.

**Anchorage.**—Vessels of 17 feet (5.2 m.) draft may moor alongside the northern wharf of the dockyard, with a bower anchor to the eastward, or alongside the eastern wharf, with an anchor to the southward, securing with her own hawsers or chains. There is 22 feet (6.7 m.) of water close off this wharf.

**Dangers.**—There are no hidden dangers, and for a steamer or sailing vessel undertaking to enter without a pilot it is only necessary to keep in mid-channel.



**Beacons and range.**—Two white beacons are placed on the eastern shore of Freeman Bay and mark the range for entering the harbor. The upper beacon is difficult to make out, being almost overgrown with brush.

The southwestern beacon is indistinct, but the anchor on the shore close to it is conspicuous. These beacons should not be relied on.

There is another entrance range—southwest angle of Government garden wall in range with Freeman Point bearing  $19^{\circ}$ . (See view B on H. O. Chart 366.)

**Wind.**—The wind generally moderates toward evening, and the land breeze in the early morning will enable a sailing vessel to leave the harbor without much difficulty.

**Tides.**—At times the tide ranges 2 feet (0.6 m.), but is very irregular.

**Pilots.**—Pilotage is compulsory on all vessels over 60 tons.

**Directions.**—Vessels of more than 20 feet (6.1 m.) draft should not attempt to enter English Harbor unless the channel is specially buoyed. Due to the narrowness of the entrance, long vessels should not attempt to pass above Barclay Point. If anchoring in Freeman Bay, keep the range beacon on, on course  $51^{\circ}$ , or if impossible to see them both, head for either on course  $51^{\circ}$  and make that course good, until Freeman Point bears  $355^{\circ}$ , changing course to steer for it on that heading. Anchor when Barclay Point bears  $265^{\circ}$  in  $4\frac{1}{3}$  fathoms (7.9 m.).

Vessels proceeding up the harbor should pay strict attention to the chart, remaining in midchannel.

The range, previously referred to, Southwest Angle Governor's garden wall—Freeman Point leads clear of Charlotte Reef and reduces the turn around Barclay Point.

A sailing vessel should not attempt to enter the harbor with the wind to the northward of east, but should anchor outside and prepare to tow or warp in.

**Supplies.**—Water may be obtained with facility by warping the vessel to the wharf, where it is conveyed on board through pipes. No other supplies are available.

**Communication.**—There is a road to St. John.

**FALMOUTH HARBOR** ( $17^{\circ} 00' N.$ ,  $61^{\circ} 47' W.$ ; *H. O. Chart 366*), 1 mile westward of English Harbor, affords anchorage for a small number of vessels of limited draft (maximum draft of 20 feet (6.1 m.)). The harbor, however, is seldom used except by coasting vessels.

**Depths.**—The harbor is divided into two parts by the shoals between Blake Island and St. Anns Point. According to the chart, the outer section has depths of 4 fathoms (7.3 m.) in its center,

shoaling gradually to the shoal; while the inner section is 1 fathom (1.8 m.) deeper, but is considerable lessened by coral heads having from 2 to 3 fathoms (3.7 to 5.5 m.). Inside the coral patch, which is awash, the harbor is generally foul.

**Caution.**—Depths in Falmouth Harbor are reported to have shoaled. Mariners are warned accordingly.

**Aspect.**—In the immediate vicinity of the harbor are two conspicuous elevations. The first is Monk Hill, on the northern side of the harbor; it is readily distinguished by the fort and signal station on its summit, 695 feet (211.8 m.) high. (See view A, H. O. Chart 366.) The other, on the northwestern side of the harbor, nearly  $1\frac{1}{4}$  miles from Monk Hill, is a much larger conical hill, thickly wooded, rising to a height of 1,058 feet (322.4 m.). This latter hill is sometimes called Saddle Hill and sometimes Falmouth Peak.

**Anchorage.**—The outer anchorage in 4 fathoms (7.3 m.) is confined to a space about 400 yards square; the inner, with 5 fathoms (9.1 m.), is difficult of access and is lessened by several coral shoals with depths of 2 to 3 fathoms (3.7 to 5.5 m.).

**Pilotage** is compulsory on vessels of over 60 tons.

**Directions.**—Standing in for Falmouth Harbor from the eastward, having passed Shirley Heights, the entrance immediately shows itself, and a vessel may then steer boldly toward the center of the opening, until the eastern end of the ruined fort on Blake Islet comes in range with a remarkable house on the western slope of Monk Hill, bearing  $352^{\circ}$ . See View A on H. O. Chart 366. This range will lead through the entrance, and having passed Bishop Shoal, which always shows itself, haul up and anchor as most convenient, according to the vessel's draft.

**Coast.**—The two elevations, Monk Hill and Falmouth Peak, previously referred to, are frequently of great value to vessels navigating the north side of the island. In clear weather both of them may be seen from Barbuda Island, 45 miles to the northward.

**OLD ROAD BLUFF** (*H. O. Chart 1004*),  $2\frac{3}{4}$  miles westward of Falmouth, is a remarkable bold, rounded headland, 135 feet (41.1 m.) high, steep-to, and easily recognized from the east or west, as it is then seen to stand out a short distance from under the high land within it. Nearly midway between it and Falmouth Harbor is Ding a Ding Nook, a small bay in which droghers find temporary shelter. The coast here may be approached within  $\frac{1}{2}$  mile. On the western side of the bluff the shore turns suddenly to the northward for  $\frac{1}{2}$  mile, forming the eastern side of Carlisle Bay.

**Carlisle Bay.**—A sandy beach sweeps round the head of this bay, and terminates on the western side in a bold, rocky point, on which

there is an old fort; the village will be seen just to the northward of it.

**Anchorage.**—There is an anchorage about midway between Old Road Bluff and the fort in 4 or 5 fathoms (7.3 to 9.1 m.) of water  $\frac{1}{4}$  mile or more from the shore. A long ground swell, however, generally sweeps in from the southward, causing a vessel to roll heavily, and landing is sometimes difficult, as the surf breaks a considerable distance from the shore.

**Goat Head.**—At  $1\frac{1}{2}$  miles westward of Old Road Bluff, on a projecting rocky point, will be seen a small rounded eminence, called Goat Head, 115 feet (35.1 m.) high, which is very remarkable, especially when seen from off the western end of the island. Between it and Carlisle Bay are three small sandy beaches skirted by a coral ledge. From Goat Head to the southwestern end of the island the shore is low and sandy, with swampy ground at the back; it is skirted by a flat coral ledge nearly dry, through which are one or two boat channels leading to good landing.

This part of the coast is also bordered with barrier reefs nearly dry in many places; and at the western end there is frequently a small sandy cay, which is occasionally heaped up or washed away by the violent action of the rollers.

**Cade Reef** lies about 1 mile from the shore and runs nearly parallel to it. Its eastern end lies about 1,500 yards south of Goat Head, and extends thence to the westward 2 miles. Its outer edge is completely wall-sided, and consequently very dangerous to approach during the night, as the lead will give no warning, and being under high land no estimated distance can be depended upon. In the daytime it may generally be seen, and will be avoided by keeping the governor's house on Dow Hill open of Old Road Bluff, bearing northward of  $84^{\circ}$ .

**Middle Reef**, an inner danger, is within the barrier, lying nearly  $\frac{1}{2}$  mile from the shore and running also parallel to it.

**Anchorage.**—Between it and the land there is excellent anchorage off Cade Bay, where there is a good watering place. The eastern or Goat Head Channel leading into it has not less than 25 feet (7.6 m.) of water and is easy of access, but too narrow to work out of; a vessel will therefore have to run out through the western passage, which is barred by a flat, rocky ledge, on which there is not more than 21 feet (6.4 m.) of water.

The best anchorage for watering is with Morris Old Mill in range with Goat Head and the large house on the Harvey estate, which will be seen near the head of the valley under Boggy Peak, bearing  $32^{\circ}$ . The above berth will place a vessel about midway between the reef and the shore.

**Directions.**—Vessels standing in from the eastward to the anchorage off Cade Bay should pass close round Old Road Bluff stand up toward Morris Old Mill, passing Curtain Bluff, which forms the eastern side of Morris Bay, within 500 yards. When abreast the mill, if the weather be clear overhead, discolored water will be seen off the end of the reef and the edge of the ledge which runs off Goat Head, making clear a mid-channel course. No leading mark can be given, so that for a stranger a pilot is necessary.

Sailing vessels standing up to this anchorage to windward must do so outside the reefs. When Cade Peak, 870 feet (265.2 m.) high, the most southern and lowest of three peaks branching off the main ridge of hills, is in range with Morris Old Mill bearing  $3^{\circ}$  the vessel will be to eastward of the reef and can stand in on that range until in mid channel. Then follow directions given above.

Sailing vessels must leave this anchorage by the western channel and quick-turning steamer may do so. In leaving run down with the coast aboard, which may be done without fear, for the edge of the ledge which skirts it eastward of Old Fort Point is generally to be seen. Morris Old Mill in line with Goat Head bearing  $89^{\circ}$  true leads northward of Middle Reef, but over patches of 2 and  $2\frac{1}{2}$  fathoms (3.7 to 4.6 m.) farther westward. When Frys Point bears  $356^{\circ}$  the vessel will be westward of these patches. Course should be changed sharply to the southward to the range for the bar, viz, Frys Mill in range with Crab Point bearing  $8^{\circ}$  astern. This is a procedure which requires great attention, so as not to get to westward of the bar, which is dangerous; should it, however, be found that too large a turn has been made, the vessel should immediately ease rapidly to eastward until on the range.

When Morris Old Mill opens to the southward of Goat Head bearing  $89^{\circ}$  true, the vessel may stand to the westward; but if standing to the eastward, the course to the south must be continued until to the southward of Cade Reef.

**Old Fort Point.**—The southwestern end of Antigua terminates at Old Fort Point, which is low and rocky. There are the ruins of a fort near the extremity, and the barracks will be seen a little inside them. Close on the southern side of the point is Johnson Islet, a rock 18 feet (5.5 m.) above the sea, covered with brushwood; being, however, under the high land, these objects are not easily made out until on a northwest or southeast bearing.

**WEST COAST OF ANTIGUA** (*H. O. Chart 1004*) from Old Fort Point turns sharply to the northward for  $2\frac{3}{4}$  miles to Reed Point. In this space are three small sandy, shallow bays named

Picartes, Frys, and Morris, which are separated from each other by remarkably bold bluff headlands about 100 feet (30.5 m.) in height. The high land of Antigua may be said to terminate at Morris Bay; in the vicinity, however, there are several hills which are of great value to vessels navigating the western side of the island, and are conspicuous after passing Old Fort Point. Six of them are close together on the southern side of Five Island Harbor.

The Saddle, 596 feet (181.7 m.) and Flat Top, 500 feet (152.4 m.) high, are the most eastern, and are at once distinguished by their names; Leonards, Pearns, and Mosquito Hills are conical, with peaked summits thickly wooded; the two former are nearly the same height, 450 feet (137.2 m.), the latter much lower. Mount Thomas or Round Hill, 547 feet (166.7 m.) high, rises on the northern side of Five Island Harbor, and appears as a large rounded wooded hill from all directions except the north-northwest, where it appears more peaked; about 1,500 yards to the westward of it there is a narrow table ridge of moderate elevation, terminating near its eastern end in a small peak, 463 feet (141.1 m.) in height, named Table Hill, which may be seen at a long distance and is a valuable landmark.

**Reed Point** lies at the foot of a wooded hill of moderate height, separated from the shore by a narrow neck of low, swampy land, forming the southern side of Mosquito Cove, which is shallow, nearly  $\frac{1}{2}$  mile deep east and west, and  $\frac{1}{4}$  mile wide from Reed Point to the opposite shore under Mosquito Hill. Pearns Point, at the north-western extremity of the cove, is low and rocky.

All this part of the coast is extremely dangerous to approach, as it is fronted by a coral ledge, the outward edge of which is about 2 miles to the westward of Frys Bay. The ledge is studded with rocky heads having as little as 9 feet (2.7 m.) of water on them, and about 1,500 yards off Frys Bay is one which is nearly awash.

There is, however, a good channel within the shoals for vessels of 14 feet (4.3 m.) draft, provided the trade wind is not too far to the northward and they have a pilot.

**Directions.**—In standing to northward along the western coast of Antigua, vessels of draft greater than 14 feet (4.3 m.) should not shut in Dow Hill House, English Harbor, with Old Road Bluff bearing  $84^{\circ}$ , until Frys Mill is open west of Crab Point, bearing  $8^{\circ}$ ; they may then haul gradually to the northwest, taking care to keep Morris Old Mill open southward of Goat Head, bearing  $89^{\circ}$ , until Hawks-bill Rock is open westward of Five Islands, bearing  $20^{\circ}$ , when they may haul northward.

Approaching Irish Bank, Great Sister open northwest of Ferris Point, bearing  $37^{\circ}$ , or Sandy Island Light bearing  $6^{\circ}$ , leads westward, and when Mosquito Hill comes in line with Flat Top Hill

the vessel will be northward of it. The soundings in this track are irregular, varying suddenly from 7 to 12 fathoms (12.8 to 21.9 m.); at night do not come within the depth of 10 to 12 fathoms (18.3 to 21.9 m.).

**The Five Islands** are readily distinguished when seen from the northward or southward; but from the westward, being backed by high land, they are not easily made out, except the largest, which is 50 feet (15.2 m.) above the sea. There are, in fact, but four islets, for the northeastern part of the highest, which is called the fifth, from its appearing disconnected at a certain distance, is attached to its western end by a low rocky ledge. They are all, with the exception of the largest, low, small, rugged, rocky, and scantily clothed with brush. The channel, with 15 feet (4.8 m.) of water, lies between the highest and the one eastward of it.

**Five Island Harbor**, a bight northeastward of the Five Islands  $1\frac{1}{2}$  miles deep, although exposed to the rollers, is a secure anchorage with the prevailing winds for vessels of 16 feet (4.9 m.) draft. The southwestern point of the entrance is formed by a remarkable red cliff, about 30 feet (9.1 m.) high,  $\frac{1}{4}$  mile to the northeastward of Pearns Point, separating two sandy beaches; and thence across to Pelican Point, at the northern entrance, it is nearly 1 mile wide. In the inner part of the harbor is a remarkable small round islet, called Maiden Island, with precipitous rocky sides, crowded with small trees, the tops of which are 90 feet (27.4 m.) above the sea.

The anchorage is obstructed by Cook Shoal, a small rocky head with 9 feet (2.7 m.) of water on it in the center of the harbor, with Sandy Island in range with Pelican Point and Maiden Island bearing  $75^\circ$ . It is also obstructed at its entrance by Pelican Shoal with 15 feet (4.6 m.) of water over it, which lies with Drew Hill in range with Maiden Island, bearing  $83^\circ$ , and Shipstern Islet just shut in with Ferris Point bearing  $35^\circ$ . Pelican Islet is small, rocky, 8 feet (2.4 m.) above the sea, 400 yards westward of Pelican Point, and is foul on its east and west sides for 200 yards.

**Directions.**—Vessels of 16 feet (4.9 m.) draft approaching Five Island Harbor from the southward pass outside the shoals; if from the northward, within them. In the former case it will be better to stand in to the southward of Pelican Shoal, between it and the Five Islands; a vessel may stand toward the latter without fear, as they are bold and steep-to, and toward the shoal no nearer than to bring Drew Hill a little open southward of Maiden Island, bearing  $83^\circ$ . When Johnson Islet is seen through the Five Island Channel the vessel will be to the eastward of the shoal, then steer such a course as will pass to the northward of Cook Shoal. When within the shoal proceed in as far as convenient, the lead being the best guide where to anchor.

Coming from the northward, when past Ferris Point keep about 400 yards from the shore and, having rounded Pelican Islet, work in to the anchorage. Leaving the harbor, run out with Seaforth Bluff shut in with the southern side of Maiden Island, which leads northward of Cook and Pelican Shoals and southward of Hurst Shoal.

**The coast** from Pelican Point trends north-northeast  $1\frac{1}{4}$  miles to Ferris Point, a wooded bluff of moderate elevation. Thence it trends to the northeastward, forming two sandy bays, named Galley and Goat Hill Bays, and terminating at Goat Hill, which is remarkable, 176 feet (53.6 m.) above the sea, and crowned with a small fort with signal staff, and which, seen from the southwestward, open of Ferris Point, is well defined. Nearly 200 yards westward of Goat Hill Point there is a small, flat-topped rocky islet, slightly wooded, called Shipstern, its western side having somewhat that appearance, being a bold, perpendicular cliff about 60 feet (18.3 m.) high, with several large masses of rock lying at its base, which are very remarkable when seen from the southwest or northeast.

**Hawksbill Rock.**—Midway between Pelican and Ferris Points, about 300 yards from the shore, is Hawksbill Rock, a small, barren, black, rocky islet, 25 feet (7.6 m.) high, bold and steep to on its western side, which may be passed at the distance of 200 yards. Its western side being composed of soft sandstone has been cut into by the action of the sea, forming a perpendicular cliff to nearly the top of the rock, where it overhangs, projecting out almost horizontally some feet.

**ST. JOHNS APPROACHES AND ROADS** ( $17^{\circ} 08' N.$ ,  $61^{\circ} 52' W.$ ; *H. O. Chart 1840.*)—The approaches to St. Johns may be considered to be the waters in the vicinity of the city and including the various entrance channels, while the roads are the anchorages outside the harbor but inside of Warrington Bank and Middle Ground.

**Depths.**—The minimum depth in the fairways and anchorage is  $5\frac{3}{4}$  fathoms (10.5 m.).

**Anchorages.**—Vessels of draft greater than 16 feet (4.9 m.) should not attempt to enter the harbor but should anchor in St. Johns Roads, where there is sufficient water for any sized ship. The anchorages in the roads are both to the northeast and southeast of Warrington Bank and Middle Ground; that to the southeast is more convenient in some respects, as it is closed to the landings. For large sailing ships the northeast anchorage is preferred.

A good anchorage to the southeast is off the bar in 6 fathoms (11.0 m.) good holding ground, with Mount Thomas in range with Pillar Rock, and the Cathedral in range with Fort James Lighthouse; also farther northeastward.

The road is exposed to westerly winds, which, however, seldom blow; when they do they are accompanied by rollers; vessels then labor heavily, and casualties have occurred.

**Outlying dangers.**—**Sandy Island** lies in the approach to St. Johns Harbor from the westward. It is situated on the eastern edge of a shallow bank from  $\frac{1}{2}$  to  $\frac{3}{4}$  of a mile in extent, and is covered with stunted trees, the tops of which are some 13 feet (4.0 m.) above the sea.

Weymouth Reef, which dries, lies between 400 and 800 yards west-southwest from it.

Depths of less than 5 fathoms (9.1 m.) extend about 800 yards northward of Sandy Island and nearly the same distance southward of Weymouth Reef.

**Sandy Island Light**, fixed white, 53 feet (16.2 m.) above high water, visible 13 miles, is exhibited from a white open iron structure with white lantern 53 feet (16.2 m.) high on Sandy Island. (See Light List.)

**Warrington Bank.**—The outer part of Warrington Bank lies about 1 mile northward of Goat Hill, the southern point of the entrance; it is 800 yards in length north and south and nearly the same in breadth, has 1 fathom (1.8 m.) of water on its shoalest part, and frequently breaks.

**Buoy.**—A bell buoy, with a framework superstructure painted black and white horizontally, is moored on the extremity of the southwestern edge of Warrington Bank.

**Caution.**—Great care should be observed in using this buoy as a navigational aid, as it is liable to drift out of position.

**Middle Ground.**—The Middle Ground is a circular bank, about 500 yards in diameter, with a least depth of  $3\frac{1}{4}$  fathoms (5.9 m.) on it, lying within the Warrington.

**Danger Range.**—Pillar Rock Light in range with Mount Thomas, bearing  $190^\circ$ , leads over the center of the Middle Ground.

**James Ground**, with  $11\frac{1}{2}$  fathoms (2.7 m.) least water, lies in the approach to James Bay and is southeastward of the Middle Ground. Between the two there is a clear channel 400 yards wide with  $5\frac{1}{2}$  fathoms (10.1 m.) of water.

**The Sisters.**—The Great Sister is a rocky islet lying about 1,500 yards from Corbizon Point, on the northern side of St. Johns Road; it is connected with the point by a shallow flat, with a maximum depth of  $2\frac{3}{4}$  fathoms (5.0 m.). When seen from the northwest it has the appearance of a wedge, with its thick end to the southwest, which is 36 feet (11.0 m.) high, bold and steep to within 100 yards to seaward.

About  $\frac{1}{4}$  mile  $71^\circ$  from this islet are the Little Sisters, a small cluster of rocks only 4 or 5 feet (1.2 or 1.5 m.) in height.



**Diamond Bank.**—The outermost northern danger lies  $3\frac{1}{8}$  miles northwestward from the well-defined Boon Point Mill. The bank is 900 yards long northeast and southwest and 500 yards wide. Although the shoal is nearly awash, it seldom breaks, but under favorable circumstances the discolored water may be seen from aloft when near it.

**Bannister Bank**, nearly midway between Diamond Bank and the Great Sister, is nearly  $\frac{1}{2}$  mile long east and west, and  $\frac{1}{4}$  mile broad, with as little as  $2\frac{3}{4}$  fathoms (5.0 m.) of water on it. The mark for its southern end is Boon Mill, in range with Hodge Hill, bearing  $99^\circ$ .

**Diamond Channel**, between these reefs, 400 yards wide, has a depth of from 4 to 6 fathoms (7.3 to 11.0 m.). Great Sister, open to the eastward of Hutchinson Old Mill, the mill bearing  $175^\circ$ , will lead through the channel in a least depth of 5 fathoms (9.1 m.).

**Pilots** are usually on the lookout in the offing near Parham, north side of the island.

**Directions.**—There are four channels of approach to the road and harbor of St. Johns; The North, or Diamond; the Northwest, the West, and Sandy Island Channel; West Channel being head to wind is not used by sailing vessels approaching. Sailing vessels bound in from the eastward generally pass around the northern end of the island, which should not be approached within about 3 miles.

**Steamers** will have no difficulty in approaching St. Johns Road and the entrance channel to the harbor. From the southward, Sandy Island Lighthouse bearing eastward of  $7^\circ$ , and from the northward, bearing southward of  $198^\circ$ , will lead clear of all dangers off the western side of the island. There are no dangers in the western approach. When about a mile from Sandy Island shape course as requisite to pass between Goat Hill and the bell buoy on southern side of Warrington Bank to the road and the harbor entrance, where a pilot will be picked up.

The following directions for the various channels between the outlying reefs are chiefly for those with local knowledge or for vessels with pilots aboard. Others should pass to westward of the outlying reefs, in accordance with directions given in the preceding paragraph.

**Diamond Channel.**—Approaching St. Johns from the northward, Great Sister open to the eastward of Hutchinsons Old Mill, the mill bearing  $175^\circ$  leads through the channel between Diamond Bank and Salt Fish Tail and between Bannister Bank and Salt Fish Tail in a minimum depth of 5 fathoms (9.1 m.). When Boon Mill (prominent) is in range with Hodge Hill bearing  $99^\circ$ , alter course to make good course  $193^\circ$ . This will lead 400 yards abeam of Great Sister. With Great Sister abeam, anchorage in St. Johns Road

may be headed for, anchoring according to draft. If proceeding to harbor entrance, when abeam of Great Sister, head for Fort St. James Light on course  $162^{\circ}$  and make it good until Pillar Rock Light can be headed for on course  $203^{\circ}$ . This latter course made good will head for harbor entrance where a pilot may be obtained. In standing toward the entrance, keep Mount Thomas bearing between  $191^{\circ}$  and  $198^{\circ}$ . This will avoid both James Ground and Middle Ground. The above directions are taken from the chart.

Sailing vessels leaving, if bound to the eastward, will gain by taking the Diamond Channel, but they should be able to lay through.

**Northwest Channel.**—In proceeding to anchorage in roads or harbor entrance by the Northwest Channel, keep Fort Barrington on Goat Hill in range with Mount Thomas, a dark peak 547 feet (166.7 m.) high. This is a long range and Fort Barrington is not easy to make out. When Boon Mill is in range with Hodge Hill bearing  $99^{\circ}$ , alter course to make good  $146^{\circ}$  until anchorage in roads is reached, when vessel may anchor at discretion. Care must be taken not to bring St. James Light bearing to southward of  $145^{\circ}$ . If proceeding to harbor entrance continue on course  $146^{\circ}$  until Pillar Rock Light bears  $203^{\circ}$ , then alter course to head for it and proceed as directed in the preceding paragraph.

With scant wind and no pilot this channel is better for sailing vessels than Diamond Channel.

**Sandy Islet Channel.**—In approaching by this channel, pass south of Weymouth Reef by keeping the northern end of Fort James just open northward of Goat Hill bearing  $88^{\circ}$ . If approaching from the southeast side of the channel, pass northwest of Hurst Shoals by keeping Kid Point open north of Ferris Point until Hawkskill Rock is in range with Mount Thomas, when the ship will be north of the shoals. Course can then be shaped to head for the harbor entrance, keeping to the southward of the Warrington Bank bell buoy or southward of the range Fort James Light-Drew Hill. If heading for St. Johns Road, keep to a position where Mount Thomas is open east of Pillar Rock and bearing  $191^{\circ}$ , and turn north to anchorage.

**West Channel,** between Warrington Bank and Goat Hill, is 1,400 yards wide. In standing up this channel to the harbor entrance the shore is steep-to and it is only necessary to keep south of the range Fort James Light-Drew Hill.

**ST. JOHNS HARBOR** ( $17^{\circ} 06' N.$ ,  $61^{\circ} 50' W.$ ; *H. O. Chart 1840*) at the head of which is situated the city of St. Johns, the capital of the island, is the chief commercial port in Antigua, whence is finally shipped almost all the produce of the island, which is brought by droghers from the outports.

It is secure against all winds except hurricanes, but shallow, confined, and inconvenient; it is also exposed to the rollers, which frequently break over the jetties and inflict serious damage.

**Depths.**—In 1924, the U. S. S. *Lawrence* found nothing less than 3 fathoms (5.5 m.) in entering the harbor and proceeding to her anchorage, which was on a bearing 188° from left tangent of Fort James. From this point, the water shoals to the shore of both the cove and the harbor. There is no longer a dredged channel and basin.

**Caution.**—It is reported that the depths shown and the position of the bar on the chart are erroneous. Positive information should be obtained from the Government pilot before proceeding across the bar.

**Aspect.**—The harbor is of irregular shape, nearly 2 miles in length from the bar to the head, and the inner part, between Week Point and the western point of The Cove to the northward, is from  $\frac{1}{2}$  to  $\frac{3}{4}$  of a mile wide. Here, however, it is divided by Rat Islet, which is small, rugged, steep, and rocky; on its summit is a large building and signal staff, which are conspicuous objects; the wall surrounding the building is 137 feet (41.8 m.) above the sea. The islet is connected to the shore by a well-built causeway with a carriage road to the foot of the hill.

**James Bluff** is the name given to the northeast entrance point of St. Johns Harbor. It is a small rocky bluff, 37 feet (11.3 m.) high, on which is Fort James, and the breadth of the entrance to the opposite shore is half a mile. From James Bluff the low, shallow, north side of the harbor trends eastward and southward to the shore end of the causeway, inclosing a small bay with depth of 7 feet (2.1 m.) named The Cove.

From the offing its locality is at once pointed out by the cathedral, a large massive white structure, with two lofty towers, the vanes of which are 163 feet (49.7 m.) above the sea.

At the back of the city there is a small wooded ridge of tableland of moderate elevation, with a distinct peak at either end. Drew Hill to the southeast is 356 feet (108.5 m.) high; the other, at the northwestern end, Scott Hill, is lower, and, being more rounded, not so well defined. They are both, however, serviceable landmarks.

**St. Johns Harbor Lights.**—A fixed green light, 106 feet (32.3 m.) above high water, visible 7 miles, is exhibited from a white house 17 feet (5.2 m.) high marked Pillar Rock in black letters, at southern side of the entrance to the harbor.

A fixed red light, 48 feet (14.6 m.) above high water, visible 5 miles, is exhibited from a white pillar 8 feet (2.4 m.) high on Fort James, northern side of entrance to the harbor. It is visible between Ledwell Point and the center of Week Bay.

A fixed red light, 15 feet (4.6 m.) above high water, visible 3 miles, is shown from a lantern attached to the gallery of the harbor master's office, which is situated at the inner northern angle of the town pier. (See Light List.)

**Anchorage.**—The best anchorage for vessels of 16 feet (4.9 m.) draft is in a position with St. James Light bearing between  $14^{\circ}$  and  $37^{\circ}$  and Pillar Rock Light bearing between  $273^{\circ}$  and  $282^{\circ}$ . With lesser draft, the available anchorage space is greater. Here vessels at anchor experience a ground swell, but with ordinary weather there is but little.

**Storm signals.**—On the approach of a hurricane the following signals are made:

By day: A square red flag with square black center, together with flags indicating the intensity and direction of the disturbance, is hoisted at the Rat Islet signal station; if a hurricane is definitely expected, two rockets are fired in rapid succession from the hill near the botanical station.

By night: Two rockets are fired in rapid succession from the botanical station.

A blue flag hoisted at the signal station and at the harbor master's flag staff, indicates an improvement in weather conditions.

**Tides.**—The rise of the tide is between  $1\frac{1}{2}$  and 2 feet (0.5 to 0.6 m.), but its time is too indefinite to be properly forecast.

**Current.**—The usual set is to the northward and westward, but when the trades are unusually strong there is a decided set from the northward and eastward, which banks up the water inside of the bar to some extent.

**Pilots and pilotage.**—Pilotage is not compulsory, but due to the constant shifting of the depth it is desirable. Pilots may be obtained by signal and are usually found outside the harbor entrance.

**Directions for entering harbor.**—Bring Week Point to bear  $116^{\circ}$  and steer for it, passing not more than 200 yards off Pillar Rock and Loblolly Point, and when the latter bears about  $264^{\circ}$  bring the north tower of the cathedral just clear of the "black roof" bearing  $98^{\circ}$ , and anchor when Fort James Light bears  $16^{\circ}$ .

The above course of  $116^{\circ}$  is taken from British Admiralty Chart No. 2065, which was extensively corrected in February, 1928.

In 1924 the U. S. S. *Lawrence* stood into the harbor with Week Point ahead bearing  $114^{\circ}$  and found not less than 3 fathoms (5.5 m.).

When turning to come out it should be borne in mind that there is more water toward Ballast Bay than toward the northeast of the anchorage berth.

**ST. JOHNS** ( $37^{\circ} 06' N.$ ,  $61^{\circ} 50' W.$ ; *H. O. Chart 1840*) lies on the side of a gentle slope, which at the upper part is about 80 feet (24.4 m.) above sea level. From the sea its location is at once pointed out by the cathedral, a large mass-

sive white structure with two lofty towers, the vanes of which are 163 feet (49.7 m.) high.

St. Johns is the capital of the Leeward Islands, the chief commercial city of Antigua, and the residence of the governor.

The population of the city in 1924 was about 10,000, decreasing.

Pier.—The town pier has a depth of 6 feet (1.8 m.) alongside. This pier is the best landing place and is marked at night by three lights—red, green, and white—like a steamer's lights bow on.

All freight and passengers must be handled from ship to shore by lighter or shallow-draft boats.

Repairs.—There is a small machine shop capable of handling minor repairs. There are no docking facilities.

Supplies.—There are no facilities or supply of fuel of any kind. There is a small amount of gasoline.

Water may be obtained from the reservoir by casks handled via ship's boat. Casks for this purpose may be obtained. Supplies of all kinds, ship and commissary, may be obtained in limited quantities.

Communications.—The island is in telegraphic communication with the United States and Europe. Steamers call here from the United States, Europe, and the West Indies.

Radio.—There is a Government-owned radio station. See International List of Radiotelegraph Stations.

Signal stations.—There are two visual signal stations, one on Goat Hill and one on Rat Islet.

A time signal is made from the Rat Islet Signal Station at 4 p. m. daily, 60th meridian time, for local craft in the harbor. This signal is not accurate.

Sanitary conditions.—The sanitary conditions at St. John's are generally good. Tropical diseases are common.

Hospital.—There is a Government hospital of 300 beds which will take visiting seamen at a nominal fee.

Quarantine regulations are controlled by the Leeward Islands Sanitary Convention. Hoist quarantine flag until port officer boards and grants pratique. Bills of healths are required. Pratique will not be granted at night.

**NORTH COAST** (*H. O. Chart 1004*).—From St. Johns Harbor, on the west coast, to Hodge Point on the north coast, the coast is low and foul with shoal water extending off 1,500 yards. Wetherell Point, however, is a remarkable dark cliff 100 feet (30.5 m.) high.

**Boon Point.**—About a mile northeastward of Wetherell Point is Boon Point, the most northern point of the island. Boon Point is the location of the vaneless mill, which has previously been given as one of the ranges for St. Johns Harbor.

**Boon Bay.**—From Boon Point the coast turns abruptly eastward, and runs in that direction  $1\frac{2}{3}$  miles to Hodge Point, the slight indentation between them being named Boon Bay.

**Off-lying dangers.**—From Diamond Bank the northern coast of Antigua is fronted by detached shoals or a barrier reef, extending 2 miles offshore in places, for a distance of 8 to 10 miles, to about 3 miles northeastward of Long Island.

**Salt Fish Tail.**—The first of these dangers east of Diamond and Bannister Banks is Salt Fish Tail,  $3\frac{1}{4}$  miles long east and west, under the depth of 5 fathoms (9.1 m.), with coral heads awash in several places.

**Jarvis Shoal**, nearly dry, and **Silver Rock**, with 6 feet (1.8 m.) of water on it, lie half a mile north and east, respectively, from the shallow east extremity of Salt Fish Tail.

**Harney Shoal**, with  $3\frac{1}{2}$  fathoms (6.4 m.), and **Horse-shoe**, awash, lie 1.2 miles northward of Prickly Pear Islet; they are separated by a passage a quarter of a mile wide, with depth of 6 fathoms (11.0 m.), known as Horse Channel, Harney Shoal on the west side of it.

**Kettle Bottom Shoals**, with very little water on some of them, form a chain extending from near Horse-shoe, southeastward for  $3\frac{1}{4}$  miles, where they join Bird Island Reef.

There is a passage through them  $1\frac{1}{4}$  miles east of Horseshoe and another  $1\frac{3}{4}$  miles northwest of Bird Island Reef.

**Three Fathom Bank**, with  $3\frac{1}{2}$  fathoms (6.4 m.) on it, lies nearly a mile northeast of Bird Island Reef.

**Four Fathom Bank**, with  $4\frac{1}{4}$  fathoms (7.8 m.) least water on it, is situated 2 miles in the same direction from the same reef. There are depths of 14 to 16 fathoms (25.6 to 29.3 m.) between these two banks.

**Prickly Pear Islet**, 15 feet (4.6 m.) high, is 800 yards north-eastward of Hodge Point and is the southern extremity of a reef, situated on the flat which extends nearly 1 mile northward of Hodge Point, forming the southern side of Horse Channel. Ward Shoal, with  $1\frac{1}{2}$  fathoms (2.7 m.) lies in the fairway about 1,400 yards  $70^\circ$  from Prickly Pear Islet.

**Boon Channel**, between the outlying shoals mentioned above and the mainland of the island, is quite straight and clear and nearly 1,500 yards broad in its narrowest part except at its eastern end, where, between the northwestern point of Prickly Pear Islet and Silver Rock Shoal, it is only  $\frac{1}{4}$  mile across.

**PARHAM SOUND** ( $17^\circ 08' N.$ ,  $61^\circ 47' W.$ ; *H. O. Chart 1004*).—For  $2\frac{1}{4}$  miles southeastward of Hodge Point to Fort Byham the coast forms the eastern side of Parham Sound, which is about 1,500 yards in extent east and west and  $\frac{1}{2}$  mile north and south, with depths of from 3 to 7 fathoms (5.5 to 12.8 m.). It is capable of receiving a few vessels of large draft, is well sheltered, has good holding ground, and is not exposed to the rollers.

**Scott Shoal**, with least depth of  $2\frac{3}{4}$  fathoms (5.0 m.), lies  $1\frac{1}{4}$  miles,  $105^\circ$  from Hodge Point.

**Addison Shoal**, with least depth of  $1\frac{1}{2}$  fathoms (2.7 m.), lies about  $1\frac{1}{2}$  miles,  $89^\circ$  from Hodge Point.

**Directions for Parham Sound.**—From the westward through Boon Channel, from a position 1,200 yards northward of Great Sister, make good a course of  $77^\circ$  until south of Silver Rock. When the northern edge of Moor Island is in range with the north bluff of Great Bird Island bearing  $117^\circ$ , alter course to keep this range ahead

until the flagstaff on Fort Byham comes in range with Pointed Hill, 270 feet (82.3 m.) high, bearing 164°. Then ahead to the southward on this range, which will pass to the westward but close to Scott Shoal, then anchor in accordance with depth. Vessels of draft greater than 18 feet (5.5 m.) should not proceed farther to the southward than Martin's Mill bearing 255°.

In addition Parham Sound may be approached from several points between northeast and northwest, through narrow openings in the Kettle Bottom Shoals. The range marks for them are given on the chart, but they are far too dangerous for a stranger, and it is only a well-experienced pilot who can make use of them.

**Long Island** protects the northern side of North Sound and the eastern side of Parham Sound. It is very irregular in shape, nearly 1 mile in length east and west, and 1,500 yards in breadth at its western end, decreasing toward the east, where it terminates in a point. The shores are low, but on its southwestern end there are some trees 40 feet (12.2 m.) high. Two hundred yards northward of the northwestern point is Moor Islet, small, rocky, and 8 feet (2.4 m.) high. Maid Island, a small island 40 feet (12.2 m.) high, lies southwest of Long Island.

**Yam Piece Shoals**, which are detached coral patches, extend nearly a mile from the western end of Long Island.

**EAST COAST** (*H. O. 1004*).—From Long Island the coast tends in a southeasterly direction to Man of War Point. A line from Great Bird Island to Indian Town Point, will, with the exception of the 3-fathom (5.5 m.) coral head enclose all foul water of less than 5-fathom (9.1 m.) depth.

**Bird Island Channel**.—The entrance to this channel, which leads into North Sound, is 1 mile northward of Great Bird Island, and the few vessels that visit the sound enter by it; but it is so exceedingly dangerous to approach, narrow, and intricate, though deep enough for a large vessel, that no directions can be given, and it can only be navigated by the most experienced pilots. As the wind blows continually in, the passage out of the sound must be taken through a narrow channel between Maid and Long Islands, in which there is a depth of 14 feet (4.3 m.), but it should be buoyed beforehand.

**Parham Harbor** is capable of admitting vessels of 13 feet (4.0 m.) draft, but the channels to it are so narrow and intricate that the few vessels which load here receive their cargoes in the North Sound or roads. The town of Parham stands in the southeastern corner of the bight, under a wooded hill 165 feet (50.3 m.) high, on the western side of which is the church, a conspicuous object from the

offing. It was at one period the seat of government, and is still of some importance, being the place of transit for the greater part of the commerce of this end of Antigua.

**Great Bird Island** is the most remarkable of the islets which inclose North Sound and a valuable object to the pilots. It is of irregular form, its western side very low, but its eastern side is a narrow strip of black, barren rock 600 yards long, rising perpendicularly from the sea to the height of 110 feet (33.5 m.), and may be seen from a long distance, the northern end particularly, as it forms a bold headland. The northeastern point of the dangerous reef and coral ledge which extends all along the northern side of Antigua as far as Diamond Bank bears from the bluff  $348^{\circ}$ ,  $1\frac{1}{2}$  miles.

**Little Bird Island**, small, rocky, and 20 feet (6.1 m.) high, lies 1 mile northwestward from Great Bird Island and on the northwest side of Bird Island Channel.

**Guana Island**,  $1\frac{3}{4}$  miles in length by about 700 yards in breadth, extending in an east-northeastern direction, almost touches the coast eastward of Parham Harbor Peninsula. At its northeastern extremity it is fronted by the barrier reef, extending southward from Great Bird Island, which, continuing southward, fronts Crump Island and Pelican Island, within which lies Belfast Bay.

**Guana and Belfast Bays.**—Between Guana Island and Indian Town Point the shore is exceedingly irregular and forms two deep bights, Guana Bay to the north and Belfast Bay to the south. Both are well sheltered by the islets and numerous reefs to the eastward and of sufficient depth for vessels of large draft; but the channels are far too intricate for them to navigate, particularly as the prevailing winds, which are here accompanied by a heavy, short sea, make even an approach to this part of the coast very hazardous. They are frequented by droghers, which are sometimes exposed to accidents and long delays, as they can not beat out except under favorable circumstances. There is a boat channel between the bays and North Sound through The Narrows at the western end of Guana Island.

**Nonsuch Bay.**—Between Indian Town and Man-of-war Points the shore again forms a deep bight called Nonsuch Bay, which is so completely protected by reefs, nearly dry, as to be a secure harbor, with a depth of from 5 to 8 fathoms (9.1 to 14.6 m.); but it is as equally difficult to navigate as those just described and quite closed against sailing vessels of large draft. Spithead Channel, the entrance to which is about  $\frac{1}{2}$  mile south-southeast from Indian Town Point, will carry 5 fathoms (9.1 m.) into the bay.



## CHAPTER IV

### THE LEEWARD ISLANDS—GUADELOUPE, DOMINICA, AND MARTINIQUE

**GUADELOUPE ISLAND** (*H. O. Chart 563*) was discovered by Columbus during his second voyage, in 1493, and so named by him in honor of Santa Maria de la Guadeloupe. By the natives, the Caribs, it was called Kurukera. It was colonized by the French in 1635, and with but slight interruption has remained ever since in their possession.

The island is separated by the Salee River into parts, the western, or Guadeloupe proper, called Basse Terre, and the eastern, called Grande Terre. The whole territory is under a governor appointed by the French Government, and with the dependencies of Marie Galante, the Saintes, Petite Terre, Desirade, St. Bartholomew, and the northern part of St. Martin, had a population in 1922 of 229,839.

Although only separated by a shallow arm of the sea, the eastern and western portions of the island differ very materially in appearance and in their geological character and is of volcanic origin.

**Basse Terre**, the western section of the island, is traversed in a north-northwesterly to south-southeasterly direction by a chain of high, inaccessible mountains, the highest of which are about 4,930 feet (1,500.0 m.) high, where the streams of the island have their source. On the eastern side of these mountains the slopes are gentle, but on the western they are very steep, and the streams rush down to the sea as rapid torrents.

With the exception of Mount Soufrere, 4,869 feet (1,484.0 m.), an active volcano, whose last eruption was in 1799, the mountains of Basse Terre are wooded. The northern peak of the range is Mount St. Rose, 1,168 feet (356.0 m.) high; the southern, Mount Carabe, 2,290 feet (698.0 m.) high. In the center are two detached peaks, close together, called the Mamelles, 2,358 and 2,536 feet (718.7 and 772.9 m.) high, respectively.

The Rivers Goyave and The Lizard are navigable by boats.

There are numerous sulphur springs on the Basse Terre.

**Grande Terre**, the eastern division of the island, is almost a level plain, having a limestone formation, with two ranges of small hills—one on the northern shore, 300 feet (91.4 m.) high, called the heights of Bertrand, and another, farther south and running nearly parallel

with the southern shore, called the hills of Ste. Anne. These hills are about 375 feet (114.3 m.) high and are separated by deep gorges, having at the bottom sluggish and sometimes stagnant streams, which gradually filter into the sea through the sand bars at their mouths.

**Climate.**—Except during the rainy season, the climate of Guadeloupe varies slightly as regards either barometric pressure, temperature, or winds. The barometer rises regularly every day till about 9.30 a. m., then falling till 4.30 p. m., rises again till 10 o'clock in the evening, when it again falls till 4.30 a. m., oscillating during each 24 hours between 29.99 inches and 30.07 inches. The mean daily height also varies during the year, being lowest in October, increasing till March or April, then remaining nearly stationary till July, when the maximum height is attained, after which the mean daily pressure gradually decreases during the rainy season. (See Meteorological Tables, Appendix IV.)

Guadeloupe and its dependencies are generally considered unhealthy. Fever and sickness prevail, but dysentery is less frequent than elsewhere.

**Temperature.**—The mean temperature of Guadeloupe is about 79° F. throughout the island. Its minimum is reached between January and March, ranging from 70° early in the morning to 84° at noon, while during the rainy season the least temperature is about 70°, rising in the middle of the day to 88°, sometimes, but very rarely, attaining a temperature of 95°.

**Rain.**—The average amount of moisture in the air of Guadeloupe is very great. If complete saturation of the point of precipitation be considered as unity, the usual amount of moisture may be represented as from 0.64 to 0.73.

Heavy rains are most frequent from the middle of July to the middle of October, being then attended by violent thunder squalls.

Showers fall occasionally at all times of the year but are less frequent on the weather side of the island than to leeward.

**Winds.**—The winds blow almost constantly from the eastward.

During the months of December, January, February, and March the wind has the most northing, somewhat heavy but short squalls from north and northeast, attended with copious showers, being not infrequent about the end of the year.

In February the wind blows freshly from the east during the day, with fine weather, the breeze decreasing every evening and rising again about 8 or 9 o'clock in the morning.

In May the winds become comparatively regular between east-southeast and southeast, continuing until November, when they gradually draw around to the northward. The commencement of the rainy season, about the end of May or beginning of June, is marked

by thick weather, with a heavy swell along the coasts. Generally, however, with the exception of squalls and occasional hurricanes, calms and light variable winds prevail during the rainy season. Calms also occur sometimes during March and April. The summit of Soufriere Mountain is generally visible shortly after sunrise for a quarter or a half hour, when it becomes hidden. If during the day it is again uncovered, it is an indication of calms and fine weather.

When the breeze is fresh on the weather side of the island it also blows strongly to leeward, but when it is light to windward it is very apt to be calm on the lee side of the island, or else a light westerly wind is experienced, modifying very agreeably the excessive heat frequently felt.

**Hurricanes** are most apt to occur during the rainy season. Any abnormal variation in the barometer is an almost sure indication of the approach of a hurricane.

There are only two safe anchorages at Guadeloupe during the hurricane season; one at Point a Pitre and the other at the roadstead of the Saintes.

**Tides.**—The tides at Guadeloupe are rather insignificant, having a spring rise of 2 feet (0.6 m.), a normal rise of 1 foot (0.3 m.), and a neap rise of 8 inches (0.2 m.). The tides are produced by two waves; one diurnal, the other semidiurnal, having a height of only two-fifths of the former; so that of consecutive tides of the lunar month one is higher than the other.

**Rollers.**—At Basse Terre rollers are experienced during the rainy season, while at Port du Moule they are only felt toward the end of the year.

**Earthquakes** are frequent at Guadeloupe. The most violent on record was in February, 1843, when the town of Pointe a Pitre was destroyed.

**SOUTH COAST.**—**Chateaux Point** ( $16^{\circ} 15' N.$ ,  $61^{\circ} 10' W.$ ; *H. O. Chart 363*), the eastern extremity of Guadeloupe, is a bluff, rocky point 144 feet (43.9 m.) high, of quite remarkable appearance, having off its northern side two sharp-peaked rocky islets. The point is clear of danger and may be passed close-to.

**Port St. Francois** ( $16^{\circ} 15' N.$ ,  $61^{\circ} 17' W.$ ; *H. O. Chart 1073*), about 6 miles westward of Chateaux Point, is only a reef harbor, about 200 yards in diameter and with a depth of 13 feet (4.0 m.). With a southeast wind a heavy sea sets in here.

The position of the harbor may be known by the houses of the town, partly in ruins. The bell tower of St. Francois church is plainly visible and is an excellent landmark.

**Buoy.**—A red entrance buoy is moored in 14 feet (4.3 m.) just southward of the reef.

**Directions.**—When off the port in 6 or 7 fathoms (11.0 or 12.8 m.), bring a remarkable tree in range with the right tangent of the house behind it bearing  $354^{\circ}$ . Keep on this range, which will lead through the reef in 14 feet (4.3 m.) about 50 yards westward of buoy.

During the season of northeast winds vessels may anchor to the southward of Port St. Francois,  $\frac{1}{2}$  mile offshore, in 6 fathoms (11.0 m.) of water, with a bottom of sand and broken shell.

**St. Francois.**—There are two sugar factories in the neighborhood, but no stores can be procured, and vessels must be entered and cleared at the custom-house of Point a Pitre. The town of St. Francois has a population of about 6,000.

**Ste. Anne Anchorage** ( $16^{\circ} 13' N.$ ,  $61^{\circ} 23' W.$ ; *H. O. Chart 1086*), situated 7 miles to the westward of St. Francois, is used by coasting vessels drawing not more than 13 feet (4.0 m.). It is well sheltered from west through north to northeast. There are two entrances, known as the Grande Passe with a depth of  $4\frac{1}{2}$  fathoms (8.2 m.) but only 80 yards wide; and Petite Pass, with a depth of  $1\frac{1}{2}$  fathoms (2.7 m.). At the western end of the village is the jail, having a square tower in the middle, surmounted by a pointed roof, and inland a little way are the gray ruins of the Plaisance Mill, which must not be confounded with another ruined mill close to the beach.

**Buoy.**—A red buoy is moored off the entrance to Grande Passe westward of the 5-fathom (9.1 m.) patch, with the eastern side of the jail bearing  $329^{\circ}$ .

**Pilots.**—Vessels bound for St. Francois and Ste. Anne should secure pilots at Gozier Islet.

**Directions.**—Vessels approaching Ste. Anne, intending to make the anchorage, should bring Grande Passe buoy in range with the eastern side of the jail and the ruined tower of Plaisance  $329^{\circ}$ , and keep this range through the channel, the least water is  $4\frac{1}{2}$  fathoms (8.2 m.). When to the northwest of the 2-fathom (3.7 m.) spot make good about  $300^{\circ}$  and anchor in 3 fathoms (5.5 m.), behind the reef. Vessels of heavier draft must anchor more to the southeast, which is more exposed, as a heavy sea sets in with a southeast wind.

**Le Diamant.**—At about 3 miles westward of Ste. Anne and  $\frac{1}{2}$  mile offshore is Diamant Rock, a little above water. West of it is Sable Islet, small and covered with sand, except the northern point, which is wooded.

**Petit Havre** ( $16^{\circ} 13' N.$ ,  $61^{\circ} 26' W.$ ; *Plan on H. O. Chart 364*).—Between the shore and the coral bank on which are the above islets is an indifferent anchorage in  $3\frac{1}{2}$  fathoms (6.4 m.) with Simonet mill  $358^{\circ}$  and Petit Havre Point  $78^{\circ}$ .

**PETIT CUL-DE-SAC MARIN** ( $16^{\circ} 12' N.$ ,  $61^{\circ} 33' W.$ ; *H. O. Chart 363*) is a basin between Basse Terre and Grande Terre to the south of the Salee River. Its limits may be said to be Gozier Island to the east and the Goyave River to the west. It contains many islands, cays, and shoal, and its navigation by large vessels should not be attempted without local knowledge or a pilot. The largest and most conspicuous of these islets are Cochons, l'Anglais, Fregate de Haut, and Fregate de Bas, but it is often difficult to distinguish them from the land. The outer edge of the banks named Mouchoir Carre, Mouton Vert, and Caye a Dupont is about  $1\frac{1}{2}$  miles southeasterly of the islets; these banks are on the western side of the channel leading to Grand Bay.

**Gozier Islet**, 3 miles westward of Sable Islet and the eastern boundary of Petit Cul-de-Sac Marin, is circular, very low, sandy, and about  $\frac{1}{4}$  mile in diameter; it lies about  $\frac{1}{2}$  mile off the town of the same name, and in the channel between there are from 10 to 16 feet (3.0 to 4.9 m.) of water; it is fringed with a coral reef. A berth of about 1,500 yards should be given this islet.

**Gozier Islet Light**, fixed white, 79 feet (24.1 m.) above high water, visible 12 miles, is exhibited from a white masonry tower 56 feet (17.1 m.) high on Gozier Islet. (See Light List.)

**Cochons Island** is in the northern part of the bay and forms the western side of the channel leading to Pointe a Pitre. It is easily distinguished by the fort and flagstaff on its eastern end. It is low and wooded, steep-to on the southern side, and on the eastern side has a coral reef, awash at low water and running off 300 yards. There is a semaphore on the eastern end of Cochons Island.

**Patate Islet** is about  $1\frac{1}{4}$  miles north-northwestward of the fort on Cochons Island, sometimes known as Ilet a Jarry, forming the western point of Pointe a Pitre Harbor.

**Jarry Mill**.—On a cliff about 40 feet (12.2 m.) high 400 yards from Patate Islet is Jarry Mill, in ruins, having erected on it a red mast with square topmark visible above the surrounding trees. This mark is used as a day mark for approaching the harbor.

**Bacchus Point**, one of the most important landmarks in approaching Pointe a Pitre, lies on the western side of the bay,  $2\frac{1}{2}$  miles southwestward from Jarry Mill. It is a triangular bluff surmounted by two hillocks and is marked by horizontal shelves all along the face of the bluff.

**Pilots**.—Pilots for Pointe a Pitre and all the neighboring ports are stationed on Gozier Islet. The signal for a pilot is the French pilot flag. This flag is the same shape and design as flag W of the International Code but the colors are reversed; that is, the center

is blue and the outer border red. At night, pilots will not put out unless summoned by the ship's whistle.

**Prohibited anchorage.**—Owing to three telegraph cables which leave the main shore at Gozier Village, northwestward of Gozier Islet, vessels should not anchor in their vicinity, indicated by the broken line on the chart.

**APPROACHES TO POINTE A PITRE** (*H. O. Chart 364*).—In the approaches to Pointe a Pitre through Petit Cul-de-Sac Marin, there is a minimum depth of  $4\frac{3}{4}$  fathoms (8.7 m.) provided the vessel remains in the prescribed channel.

**Dangers.**—The following shoal and dangers are found in the approaches.

**Caye Martinique**, almost awash, extends 1 mile northeastward from Point Goyave. From the end of this cay, a bank with less than 5 fathoms (9.1 m.) extends 1,200 yards to the northeast.

**Caye a Dupont**, with two spots awash and a diameter of about  $\frac{1}{2}$  mile under 5 fathoms (9.1 m.) lies  $\frac{3}{4}$  mile north-northeastward of Caye Martinique.

**Mouton Vert** consists of patches of coral, some with depths of 2 fathoms (3.7 m.) and all with depths of less than 4 fathoms (7.3 m.). The most southern patch, with  $3\frac{1}{4}$  fathoms (5.9 m.), lies 500 yards northeast of Caye a Dupont.

**Range marks.**—The west tangent of Cabrit Island in range with Bacchus Point leads between Caye a Dupont and Mouton Vert with a least depth of 7 fathoms (12.8 m.).

**Mouchoir Carre** is composed of patches of coral about 700 yards square with from  $2\frac{1}{4}$  to 3 fathoms (4.1 to 5.5 m.) of water over them. They lie about  $2\frac{1}{4}$  miles southwest of Gozier Islet. A  $4\frac{1}{4}$  fathom (7.8 m.) spot lies 1,000 yards  $317^\circ$  from Mouchoir Carre Light Buoy. The spot lies very close to the right of the entrance range.

**Light Buoy.**—A red conical buoy showing a fixed white light 14 feet (4.3 m.) high, visible 8 miles, is moored in  $4\frac{1}{2}$  fathoms (8.2 m.)  $13\frac{1}{4}$  miles  $251^\circ$  from Gozier Island Light. This buoy is the fairway buoy for the port.

**Caye Plate**, about 200 yards in diameter, with  $3\frac{1}{4}$  fathoms (5.9 m.), lies 900 yards westward from Mouchoir Carre.

**Range mark.**—The right tangent of Hache Island in range with Bacchus Point bearing  $304^\circ$  leads between Mouton Vert and Mouchoir Carre and clear of Caye Plate.

**Mazarin Bank**, with 3 feet (0.9 m.) of water over it, lies between Ilet a l'Anglais and Cochons Islet and breaks with the least sea.

**Range.**—All of Les Saintes, open of Capesterre Point, bearing  $205^\circ$ , leads southeastward of all the outer shoals.

**Entrance range lights—Fouillole Point Light Rear Range.—**

An occulting white light 76 feet (23.2 m.) above sea level, visible from 343° to 353° for 8 miles, is shown from a red iron mast with balcony and ball top mark, 74 feet (22.6 m.) high. (Missing October 20, 1928.)

**Monroux Islet Light—Front Range.—**An occulting red light 34 feet (10.4 m.) above sea level, visible from 343° to 353° for 8 miles, is shown from a white iron column on Monroux Islet.

The day mark, which is a mast painted red and white, located 91½ feet west of the light, is difficult to distinguish. (Missing October 20, 1928.)

**Outer anchorages—Fleur d'Epee.—**This anchorage, in 5 to 6½ fathoms (9.1 to 11.9 m.) northward of the entrance fairway buoy, and half a mile southeast of Cay d'Argent, is used by sailing vessels with winds too light, and by vessels waiting for daylight to enter the port. The anchoring marks are Jarry Mill, seen midway between Cochons Island signal staff and Monroux Islet light pillar, bearing 312° true, and Fort Fleur d'Epee flagstaff, bearing 45° true. In winter this anchorage is dangerously exposed to southerly winds. Vessels loading in any of the neighboring sugar ports lie here while obtaining clearance.

With local assistance perfectly sheltered anchorage can be had half a mile northward of Ilet a l'Anglais, passing, preferably northward of Banc du Mazarin.

**Petit Bourg** is frequented by small vessels and may be reached, after passing within the line of outer shoals, by passing close to the southward of Fregate de Haut Island and of Hache Island, and keeping on the same course ½ mile farther, when good anchorage in 20 feet (6.1 m.) will be found 30 yards offshore.

**Goyave anchorage.—**About 1,200 yards northward of Goyave Village there is anchorage in 3¾ fathoms (6.9 m.). Local knowledge is essential to take a ship in and out.

**Prohibited anchorage.** See page 163.

**Directions for approach.—**In daylight: From the northeast a vessel can pass between Gozier Islet and the fairway or entrance buoy in 4½ fathoms (8.2 m.). When the fairway buoy is sighted it should be put ahead on a course of 280° and maintained in that position until 1 mile distant, Gozier Island Light bearing 43°. Then Jarry Mill will be slightly open southwest by Cay d'Argent Light Buoy, bearing 315°. Keep it so, passing about 1,200 yards to starboard of fairway buoy. When about 1,000 yards from Cay d'Argent Buoy (missing October 20, 1928) a vessel may anchor in Fleur d'Epee anchorage. If proceeding inside the harbor, continue until abeam of Cay d'Argent Buoy.

**Approaching from the southwest**, a vessel should keep all of Les Saintes open southeastward of Capesterre Point bearing  $205^{\circ}$  until the entrance range—Fouillole Point Light—Monroux Island Light (see p. 164) is on. This range course passes very close to a  $4\frac{1}{4}$  fathom (7.8 m.) spot located 1,000 yards north-northwestward of fairway buoy, so when fairway buoy is slightly abaft the starboard beam, a vessel should keep about 100 yards to the left of the range until Gozier Island light bears  $85^{\circ}$ , where course can be shaped either to the channel entrance or to anchorage in Fleur d'Epee Anchorage.

A vessel may also pass between Mouchoir Carre and Mouton Vert by keeping Bacchus Point in range with right tangent of Hache Island bearing  $304^{\circ}$  until Cochons Island Fort or signal station bears  $12^{\circ}$ , when it may be headed for. This course will pass 200 yards northwestward of Caye Plate. When Fregate de Haut is broad on port beam, alter course to make good  $29^{\circ}$  which head for Cay d'Argent Light Buoy.

There is also a passage between Caye a Dupont and Mouton Vert. Bring Bacchus Point in range with left tangent of Cabrit Point bearing  $317^{\circ}$  until the Cochons Island Fort or signal station bears  $17^{\circ}$ , when it can be headed for until Fregate de Haut is broad on the port beam. Then alter course to make good course  $32^{\circ}$  which will head for Cay d'Argent Light Buoy.

**At night** vessels should keep on the entrance range, sheering out to the left, as previously described, to avoid the  $4\frac{1}{4}$  fathom (7.8 m.) spot.

**POINTE A PITRE HARBOR** ( $16^{\circ} 13' N.$ ,  $61^{\circ} 32' W.$ , *H. O. Chart 364*) near the entrance of the Salee River, is approached through a somewhat crooked channel. It is formed by Cochons Island and the neighboring islands on the west by the cays and reefs extending from the shore on the east. This harbor is considered one of the finest in the Antilles and affords secure and safe anchorage during all seasons and in all kinds of weather.

A project for the improvement of the harbor is supposed to have been placed in execution but in reality up to 1927 nothing has actually been done. The project consists in extending and widening the wharves and in dredging the entire harbor.

**Depths.**—Depths of 4 fathoms (7.3 m.) can be carried to the anchorage. Alongside the wharves an average depth of 21 feet (6.4 m.) is available.

**Landmark.**—Fort L'Union, in ruins, situated at the southeastern corner of the harbor, is almost completely hidden by trees.

**Caye d'Argent** is about 500 yards southwestward of Fort L'Union and is the eastern entrance point of the harbor.



**Light buoy.**—Red Light Buoy No. 1, showing a fixed green light, marks the channel edge of the channel southwest of Cay d'Argent. (Missing October 20, 1928.)

**Rat Islets** are two small wooded islets with two dry rocks just south of them, situated 450 yards north-northwestward of Cay d'Argent.

**Light buoy.**—Red Light Buoy No. 3, showing a fixed green light, is moored on the channel's edge just westward of Rat Islets.

**Monroux Island** lies 500 yards northward of Rat Islets. It is connected to the main island by a dry coral reef. There is a landing pier on the south side of the island.

The front entrance range light and mark is located on Monroux Island. (See p. 164.)

**Light buoy.**—About 200 yards westward of Monroux Island Light on the edge of the reef is moored a red light buoy showing a fixed green light.

**Point Fouillole.**—From Fort L'Union the shore line trends in a general northwesterly direction for 1,300 yards to Fouillole Point. Here is located the rear entrance range light. (See p. 164.)

**Sugar mill.**—The d'Arbousier sugar works is one of the largest in the West Indies. The high chimney, at present painted black, is a most prominent mark.

From Fouillole Point the shore trends northwesterly to and past the town of Pointe a Pitre, to the entrance to the Salee River.

**Dangers.**—A coral bank, with exposed heads, extends 600 yards eastward and 400 yards north-northeastward from Cochons Island Fort.

**Light buoy.**—A black light buoy, No. 2, showing a fixed red light is moored on the eastern edge of this bank.

**Rose Bank**, dry at low water, lies 800 yards northward of the signal staff on Cochons Island. It is unmarked.

**Couillons Bank**, almost dry, is located 600 yards westward of Fouillole Point Light.

**Beacon.**—A white beacon surmounted by a white disk marks this bank.

**Provençal Bank**, dry at low water in two places, lies 1,000 yards west-northwestward of Fouillole Point.

**Brick Bank**, with depths of 13 feet (4.0 m.), lies in the northern part of the harbor, about 200 yards westward of the town.

**Note.**—The above buoys were destroyed by the hurricane of 1928 and except where noted have been replaced by temporary buoys.

**Anchorage.**—The best anchorage is with chimney of sugar mill bearing 60° and Monroux Island Light bearing 147° in 4¾ fathoms (8.7 m.).

There is a mooring body 250 yards southeastward from this anchorage position.

There is a private wharf alongside the town belonging to the Company General Transatlantic with depths of 21 to 23 feet (6.4 to 7 m.).

A wharf has been completed at Pointe Patate, Pointe a Pitre Harbor, Guadaloupe, and a channel leading to this wharf has been dredged to a depth of 21 feet (6.4 m.), allowing vessels to lie alongside the wharf and load. Mooring buoys placed on the sides of the channel enable vessels to warp to the wharf and moor when going alongside.

**Buoys.**—The channel to this wharf is marked by three white buoys on the northern side and three red buoys on the southern side.

**Tides.**—It is high water full and change at 10 hours; height of high water  $1\frac{1}{4}$  feet (0.4 m.). The force and direction of the wind will modify this height slightly.

**Pilots.**—See page 163. Pilotage is compulsory for all merchant vessels above 60 tons.

**Directions.**—Having reached a position near Red Light Buoy No. 1, proceed into the harbor by leaving the three red buoys on the starboard hand and the black buoy on the port hand. Favor the port side near the black buoy. Leave the Couillons Bank Beacon on the port hand and anchor in vicinity of the mooring buoy.

**POINTE A PITRE** ( $16^{\circ} 11' N.$ ,  $61^{\circ} 32' W.$ ; *H. O. Chart 364*), on the northeastern side of the harbor, is one of the most important commercial places in the Leeward Islands. It was settled in 1763 and was in 1843 destroyed by an earthquake.

The population in 1927 was 27,679.

The United States is represented by a consul and vice consul.

**Wharves.**—There are two wharves—one private, belonging to the Company General Transatlantic located on the city's water front with from 21 to 23 feet (6.4 to 7.0 m.) alongside; the other public, located across the harbor from the town with about 16 feet (4.9 m.) alongside. Actually, wharves are not accessible to vessels.

Cargo is normally handled by lighters, of which there are 42 open ones available, although some steamers moor about 30 feet from the wharf and merchandise is landed on plank platform. Boat landing is near the port office.

No tugs are available.

**Repairs.**—There are no docking or other facilities capable of making repairs.

**Supplies.**—Ship and engineer supplies are scarce. Fresh commissary provisions are available in reasonable quantities. Other commissary supplies are to be had in small quantities.

**Fuel.**—No coal or bunker fuel available. Gasoline is available, but the price is high.

**Water** may be obtained, but must be obtained from a private concern and provided advice is given in advance and the water is on hand.

**Communication.**—There is communication with New York, with London direct, also with Bordeaux and Marseille. There is no railroad in the island, but stage coaches and steamers run daily. There are telephones to each parish. There is also steamer communication with New York, New Orleans, Colombia, Venezuela, British Guiana, and the islands of the West Indies. A land line connects the city with Basse Terre, and from these is a cable connecting the island with the United States and Europe.

**Radio.**—There is a radio station near Pointe a Pitre (Destrellan Station), call letters HYU. See International List of Radiotelegraph Stations.

**Hospitals.**—All cases, except those of a trifling nature, must be sent to St. Claude Colonial Hospital, located 37 miles from Pointe a Pitre. If possible, cases should be carried to St. John's Antigua or Port Castries, St. Lucia.

**The sanitary condition of the town is poor.**

**Quarantine.**—Vessels with contagious diseases on board undergo their quarantine period at Les Saintes.

**Baie Ste. Marie** (*H. O. Chart 1083*) is situated immediately southward of the mouth of Riviere Goyave, and may be easily recognized by three red cliffs. Between the river's mouth and the northern red cliff the northwest shore of the bay is fronted by a shallow bank extending off 700 yards; from the shore between the three red cliffs the bank diminishes in breadth to 300 yards.

**Caye de la Loire**, with 2 to 3 fathoms (3.7 to 5.5 m.) on it, is a quarter of a mile long, east and west, the latter extremity being 1,100 yards eastward from the northern red cliff.

**PORT STE. MARIE** ( $16^{\circ} 06' N.$ ,  $61^{\circ} 34' W.$ ; *H. O. Chart 1083*) is an important port of export for sugar. Its locality is easily distinguished by three red bluffs just north of the town.

It is an anchorage for vessels not drawing over 15 feet (4.6 m.), but the approaches are intricate, and the assistance of a pilot is essential.

**Ste. Marie Harbor Lights.**—A fixed white light, 19 feet (5.8 m.) above high water, visible 3 miles, is exhibited on the shore, about 153 yards eastward of the harbor pier, which has fallen into disuse. (See Light List.)

A fixed white light, 8 feet (2.4 m.) above high water, visible 3 miles, is exhibited on piles at northern extremity of the 1-fathom (1.8 m.) shoal, on western side of Le Gross Loup. (See Light List.)

**Light buoy.**—A fixed red light is exhibited from a buoy moored on the northwestern edge of Le Gross Loup.

**Beacons.**—There are three beacons in the harbor—one at the southeastern extremity of Les Peignes, one at the northeastern point of the Caye a Saute, and the third on the southwest corner of Caye Bateau.

**Entrance channels.**—There are three channels into Port Ste. Marie—two to the north and one to the south. The southern pass is very poor and seldom used. The two northern passes are used by sailing vessels, according to the direction of the wind.

**Directions.**—Vessels for Ste. Marie must be entered at the custom-house at Pointe a Pitre. Unless the vessel is to discharge part of its cargo there it should not, however, enter that harbor, as it will thus avoid having to pay the rather heavy water tax. Vessels should stand in for Gozier Islet Light, take a pilot, and come to anchor under his direction outside the harbor. When pratique is granted the captain of the vessel can enter with a boat. He should then

employ a special local pilot for Ste. Marie. This pilot is not a Government pilot nor is his employment compulsory, but it will be found necessary.

In making the port of Ste. Marie vessels should bring the middle red cliff bear  $260^{\circ}$  and stand in on that bearing until the northernmost buoy is well opened to eastward of the next buoy. Then alter course to make good course of  $175^{\circ}$ , which will leave the light and buoy on the port hand and the beacons on the starboard hand. When 300 yards to the southward of Caye a Saute moor ship.

**SOUTHEAST COAST** (*H. O. 363*).—The District of Capesterre, lying southward of Ste. Marie, was formerly the richest and most highly cultivated part of Guadeloupe. Rising high above it is Madeleine Mountain, with numerous torrents rushing down its abrupt slopes.

Off Capesterre Point the soundings are very irregular, and a berth of 1 mile at least should be given to the coast.

**Caution.**—Sailing vessels should, at certain seasons, be prepared for the violent gusts of wind which rush down from the mountains.

**Coast.**—The coast from Capesterre Point to Vieux Fort Point forms a series of points and open exposed bays into which droghers come for sugar.

**Vieux Fort Point**, the southwestern point of Guadeloupe, is formed of blackish rocks, with a large rock close off of it.

**BASSE TERRE ROADS** ( $16^{\circ} 00' N.$ ,  $61^{\circ} 44' W.$ ; *H. O. Chart 1063*) is an open roadstead. With the wind from south or west the anchorage is unsafe and vessels should at once go to sea. During the season of the trades, although a swell always sets in, the anchorage is reasonably safe.

**Depths.**—The 20-fathom (36.6 m.) curve is 350 yards offshore, thence the depth shoals very rapidly to the shore.

**Basse Terre Harbor Lights.**—A fixed red light, 42 feet (12.8 m.) above high water, visible 5 miles, is exhibited from the quay, and a similar one, but of less elevation and visible only 2 miles, from the end of the wharf.

**Anchorage.**—The best anchorage is off the town in from 16 to 22 fathoms (29.3 to 40.2 m.) 300 to 400 yards from the shore.

Abandoned mooring anchors and chains lie in about 30 fathoms (54.9 m.) bearing  $261^{\circ}$  to  $281^{\circ}$  distant 1,000 yards from Basse Terre Harbor Light. Vessels should not anchor in this position for fear of fouling their ground tackle.

**Prohibited anchorage.**—Vessels are not allowed to anchor north of the cemetery on account of a cable landing.

The telegraph cable to Les Saintes leaves the shore from the small white cable hut about 800 yards to the northward of the Galion River and runs in a  $192^{\circ}$  direction for about 600 yards distance and then in a  $162^{\circ}$  direction. Vessels must anchor to northward of this cable.

**Signal station.**—A signal station is established at the harbor office, from which communications are made and received by the international code of signals. In bad weather communication with the shore is impossible.

**Storm signals.**—Upon the approach of a storm or bad weather, a red flag is displayed at the signal station mast instead of the national ensign. At night, two red lights are shown above the permanent one on the quay.

**Pilots.**—Pilots are available and meet incoming ships about  $\frac{1}{2}$  mile of the shore.

**Directions.**—Vessels approaching the anchorage from the southward should haul close round the southern point of the island, keeping always prepared for the violent puffs of wind which rush down from the mountain, and, keeping the shore close aboard, should haul up for anchorage and anchor off the town, as most convenient, in from 16 to 22 fathoms (29.3 to 40.2 m.) 300 to 400 yards from the shore.

**BASSE TERRE** ( $16^{\circ} 00' N.$ ,  $61^{\circ} 44' W.$ ; *H. O. Chart 1063*).—The town of Basse Terre is the seat of government of the island and had a population in 1927 of about 8,300. The town is of no commercial importance. The United States consular representatives for the island of Guadeloupe are located at Pointe a Petre.

**Wharves.**—There is a landing place for small boats at the two town wharves. One of these wharves is of pile construction and one frame construction. There are no facilities for handling cargo except by four privately owned lighters, which are not available for public use.

**Supplies.**—Ships' supplies are unobtainable. Engineers' supplies are very scarce. Fresh commissary provisions are obtainable in limited quantities.

**Communication.**—There is frequent mail communication with other islands. The West Indian & Panama Telegraph Co.'s cable lands here. Basse Terre is also connected with Dominica by submarine telegraph. There is steamer communication with New York, Panama, Venezuela, Colombia, France, and the islands of the West Indies.

The sanitary condition of the town is very poor.

**Hospital.**—There is a Government hospital of 100 beds at Camp Jacob.

**WEST COAST** (*H. O. Chart 363*).—From Basse Terre the coast of Guadeloupe heads north-northwestward for 20 miles. It is steep-to with the exception of about  $2\frac{1}{2}$  miles south of Anse a la Barque, where a shoal with  $2\frac{1}{2}$  to  $3\frac{1}{4}$  (4.1 to 5.9 m.) makes out 300 yards from the shore.

**Anse a la Barque**, 6 miles northward from Basse Terre, has better shelter for small craft than Basse Terre. The bay is very small, being only 400 yards wide, with depths of 5 fathoms (9.1 m.).

**Anse a la Barque Lights.**—A fixed red light, 69 feet (21.0 m.) above high water, visible 4 miles, is exhibited from a mast on the northern side of the entrance to Anse a la Barque.

A fixed white light, 20 feet (6.1 m.) above high water, visible 5 miles, is exhibited from a mast in the inner part of the cove.

**Bouillante Bay**,  $2\frac{1}{2}$  miles northward of Anse a la Barque, whose north side is formed by yellow cliffs and at the head of which is Bouillante village, affords anchorage in less than 11 fathoms (20.1 m.) 400 yards southward of the village.

**Goyave or Pigeon Islands** are two islets, the largest of which is 128 feet (39.0 m.) high, lying half a mile from the northern shore of the main island. They are almost perpendicular, excepting the side toward the coast, and between them and the latter there is a good passage over 20 fathoms (36.6 m.) deep, a vessel having to be 400 yards from the shore before getting less than 11 fathoms (20.1 m.).

**Point Noire**, composed of black rocks, is located about 5 miles northward of Pigeon Islands;  $1\frac{1}{2}$  miles to the south of the point is the village of the same name. A vessel may anchor in 6 fathoms (11.0 m.) about 200 yards from the village. The landing, on a gray sand beach, is just to the south of the village.

**Gros Morne.**—From Point Noire the coast trends northward 4 miles to Gros Morne, an isolated hill 682 feet (207.9 m.) high; detached from the northeast extremity is a pyramid-shaped black rock. Anse Deshayes is sheltered on the north by Gros Morne, above mentioned, and has anchorage in 7 fathoms (12.8 m.) in the center, the bottom sand and rock.

**Grand Sec** is a bank which commences off Ferry Point between  $\frac{1}{2}$  and  $\frac{3}{4}$  of a mile from the shore and extends northward to within 1,500 yards of Kahouanne Island. Off Breton Point, on this bank, there is a depth of a little over 30 feet (9.1 m.) of water.

**La Perle Shoal**, on which is 6 feet (1.8 m.) of water, is about 700 yards westward of the point of the same name and a little more than a mile  $199^{\circ}$  from the south point of Kahouanne Island. The bank runs to the northward for  $\frac{1}{2}$  mile and is parallel with the shore. Between the bank and shore there is 30 feet (9.1 m.) of water, but this passage should not be attempted.

**Pointe Allegre.**—The coast from Gros Morne runs in a north-east direction  $4\frac{1}{2}$  miles to Pointe Allegre, the north extremity of the western division of Guadeloupe.

**Kahouanne Island**, with a somewhat saddle-shaped summit, 243 feet (74.1 m.) high, lies nearly 2 miles west of Pointe Allegre. It is wooded excepting on its southeast side, which is grassy. The

islet is steep-to excepting on its northeast side, whence a bank with depths under 3 fathoms (5.5 m.) extends 1,000 yards.

**Tete a l'Anglais**, a small gray islet 151 feet (46.0 m.) high, skirted by reefs, lies about  $1\frac{1}{2}$  miles off the northwestern point of Guadeloupe; thence the coast turns suddenly eastward, continues very high, and should be navigated with extreme caution.

**Winds and currents.**—On the western coast of Guadeloupe there is a land breeze almost every night, extending about 2 miles offshore, and exceedingly useful to vessels bound either north or south.

Outside of this limit light variable breezes and calms, lasting several days, are sometimes experienced, so that vessels which do not approach the land close enough to benefit from the land breeze would do well to keep 20 or 25 miles offshore to avoid these calms.

A strong southeasterly current, depending on the strength of the northeast trade wind, is frequently felt off the western coast of Guadeloupe. Tides are very little felt.

**GRAND CUL DE SAC MARIN** (*H. O. Chart 363*) is the large bay between Allegre and Grisgris Points. The whole bay is bordered by the reef previously mentioned, extending from 1 to 3 miles offshore, and is studded with islets and shoals. The sea is smooth, but the bay can not be navigated without a pilot.

**The pilots** who are familiar with the intricate channels of Grand Cul de Sac Marin are almost all fishermen, and, like those of the Bahama Banks, endeavor in navigating these channels to have the sun behind them, and are guided to a great degree by the color of the water in avoiding dangerous shoals.

**Channels.**—There are three main channels through the Grand Cul de Sac Marin leading to the various sugar-loading places. These are the Grande Coulee Pass, the Caret Pass, and the Colas Pass.

**Grande Coulee Pass** is between the reefs which extend from the eastern side of Tete a l'Anglais and the western side of Blanc Isle, in which there is a depth of 6 fathoms (11.0 m.) and leads to the anchorage and village of Ste. Rose.

**Caret Pass**, 6 miles to the eastward of Grande Coulee Pass, has the same depth and leads to Mahault Bay and the River Salee.

**Colas Pass**, the most eastern, is the deepest of the passes, having depths of 10 fathoms (18.3 m.); it also leads to Mahault Bay and the River Salee.

**Rose Bay** is sheltered on the north by a reef, through which are two small openings; with a depth of from 15 to 22 feet (4.6 to 6.7 m.); the western opening leads to the small bay of Ramee; the Grande Coulee Pass lies north of it. On this part of the shore a long, low, narrow, level plain lies at the foot of the great mountain range. The town of Ste. Rose has a population of about 5,050.

**Lamentin Bay.**—Negre Point, the extremity of a narrow ridge of land, separates Mahault Bay from that to the west, named Cercelle, and west of the latter is the Lamentin Bay, with the town of the same name. These bays are obstructed by sand banks and only navigable for very small vessels.

A small river of the same name runs into the sea at the head of the bay, and Grand River, the principal stream of Guadeloupe, which rises in the central mountains, empties near the northern point of the bay.

**Mahault Bay** is about 6 miles eastward of Rose Bay, on the northern side of the narrow tongue of land which separates Grande Terre from Capesterre. There is excellent anchorage in the outer part in 7 or 8 fathoms (12.8 to 14.6 m.) of water, and farther in, off the town, in from  $3\frac{1}{4}$  to  $4\frac{1}{2}$  fathoms (5.9 to 8.2 m.) The best pass to enter is the Caret.

**River Salee.**—There is anchorage in  $\frac{7}{8}$  fathoms (12.8 m.)  $\frac{3}{4}$  of a mile northward of the entrance of the River Salee and eastward of Christophe Island, on which there is a red beacon.

**Salée River Light**, fixed white, 16 feet (4.9 m.) above high water, visible 2 miles, is exhibited from a post at the northern entrance to the Salee River, Grand Cul de Sac Marin.

**Petit Canal Bay**, on the western side of Grande Terre, extends from Macou Point, off which is Macou Island lying 4 miles northward of the entrance to the Salee River, to Grisgris Point, 3 miles to the northward of it; it is, however, only an anchorage for droghers, who find their way by the eye through the reefs fronting it to the westward.

**Beautiran or Baie du Canal.**—This is not really a port, but a point of discharge. It is on the eastern shore of the Grand Cul de Sac Marin, about  $2\frac{1}{2}$  miles southeastward from Port Louis. The anchorage is about 2 miles offshore in 8 fathoms (14.6 m.) of water.

Vessels for Beautiran or Baie du Canal (it is known by either name, indifferently) should call at Port Louis. There the necessary pilot will be found.

**Port Louis** ( $16^{\circ} 25' N.$ ,  $61^{\circ} 32' W.$ , *H. O. Chart 1065*) is an open roadstead. The anchorage is partially sheltered from June to October, although a north-northwest swell is felt; at other times, however, it is quite exposed to westerly winds and heavy swells.

It is easily recognized by the high chimney of the Souques sugar factory, 1 mile eastward of the town, the church tower, and the Barbotteau Mill.

The population is about 4,500. Vessels come here to load sugar, but must enter and clear at the customhouse at Pointe à Pitre.



**Anchorage.**—The best anchorage will be found directly abreast of the town in 8 fathoms (14.6 m.) of water, about  $\frac{1}{4}$  mile offshore.

This part of the coast is foul to the distance of nearly  $\frac{1}{4}$  mile, and the bank of soundings only extends about 1,300 yards offshore.

The landing pier is about 300 yards south of the light and has a depth of 5 feet (1.5 m.) alongside. Care should be taken in going alongside to avoid the rocks in the vicinity.

**Port Louis Light**, fixed white, 39 feet (11.9 m.) above high water, visible 5 miles, is exhibited from a mast on the beach.

**Souffleur Bay** is a small bight northward of the town, with a few rocky heads above water in the middle of the bight.

**Grande Vigie Point** is quite remarkable, being formed by a sharp rocky point, something like a ship's cutwater, and surmounted by a flat table-land. From Grande Vigie Point as far as St. Marguerite Bay the eastern coast of Guadeloupe is bold and clear, with rocky cliffs about 200 feet (61.0 m.) high.

**St. Marguerite Bay** is an open roadstead, without any protection from the trade wind, and consequently not safe. From this bay the shore again becomes foul to the distance of from 100 to 400 yards as far as Chateaux Point.

**PORT DU MOULE** ( $16^{\circ} 20' N.$ ,  $61^{\circ} 21' W.$ ; *H. O. Chart 1059*), nearly midway between Grande Vigie and Chateaux Points, is exposed to the trade winds and is protected only by a reef which is partially under water. The harbor is bad, and the entrance to the same is less than 200 yards wide, with a rough and rocky bottom. Vessels often strike on the bar, and wrecks are of frequent occurrence. There is often a heavy swell on the bar, which may detain vessels from entering or leaving. From the end of October to March, the port is not considered safe.

**Depths.**—The western channel, Hastings Pass, carries from 5 to 7 fathoms (9.1 to 12.8 m.). The harbor itself has depths of about 4 fathoms (7.3 m.).

**Aspect.**—The port may be recognized by a large chimney to the southwest of the town; and upon a nearer approach by the battery constructed on the western point of the bay.

**Port du Moule Light**, fixed white, 46 feet (14.0 m.) above high water, visible 7 miles, is exhibited from a mast near the signal staff. (See Light List.)

**Dangers.**—**The Barrel of Beef.**—A rock with 2 fathoms (3.7 m.) of water over it lies 300 yards northward of the light.

**Mouton de Bas** is a coral bank, partially uncovered, lying parallel to the shore northward of the light.

**Mouton de Haut**, partially bare, extends from the eastern entrance point to the shore and forms a lee for the anchorage.

**Channels.**—There are two entrance channels to the port: One, Hastings Pass, with from 5 to 7 fathoms (9.1 to 12.8 m.), 20 yards wide, passes between Mouton de Bas and the Barrel of Beef; the other, Grande Pass, between the Barrel of Beef and Mouton de Haut, has a depth of  $2\frac{3}{4}$  fathoms (5.0 m.).

**Channel range.**—Sergeant Mill in range with the corner of north wing of customhouse bearing  $173^{\circ}$ , leads through Grande Pass in not less than  $2\frac{3}{4}$  fathoms (5.0 m.).

**Anchorage.**—There is limited anchorage in the lee of Mouton de Haut in 4 fathoms (7.3 m.). Vessels lying here are required to moor head and stern, one anchor to the reef and one to the shore. Vessels in the harbor are required to furnish a boat, four men, and a hawser on arrival and departure of each vessel. There is room in the harbor for nine vessels moored in tiers.

In moderate weather, a vessel may anchor outside the reef in 9 fathoms (16.5 m.) with the light bearing  $172^{\circ}$ .

**Wind and current.**—Vessels should not go to the westward of the port, as there is always a current in toward the shore, and it is usually calm from 5 to 6 o'clock in the evening.

**Signals.**—Signals governing the practicability of entering the harbor are made to approaching vessels from the signal station located just to the westward of the light.

These signals are as follows:

A red flag signifies that a vessel must keep at sea.

A white flag with a red square in its center signifies that a pilot is coming out.

A white flag with a diagonal red cross signifies that the vessel may enter.

**Pilots.**—The harbor can be entered only with the aid of a pilot, who is read to board vessels when the bar is passable.

As entry is impractical without a pilot, no directions are given.

**LE MOULE** ( $16^{\circ} 20' N.$ ,  $61^{\circ} 21' W.$ , *H. O. Chart 1059*) is about 18 miles from Pointe à Pitre. Its population is about 10,000. There is a daily coach trip to Po'nte à Pitre.

**Supplies.**—Fresh water, meat, and vegetables may be obtained in reasonable quantities.

**Communication.**—There is a telegraph office in communication with the remainder of the island.

**La Couronne Rock**,  $1\frac{1}{2}$  miles eastward of Port du Moule, is an excellent landmark.

**Gourde Islet.**—From Port du Moule to Chateaux Point there is no safe anchorage. About  $4\frac{1}{2}$  miles northwestward of the latter is Gourde Islet, about 40 feet (12.2 m.) high, which is rather remarkable and lies just outside the reef, which is steep-to.

**DESIRADE ISLAND** ( $16^{\circ} 19' N.$ ,  $61^{\circ} 03' W.$ , *H. O. Chart 363*) lies about 5 miles eastward of Guadeloupe, of which it is a dependency. It is 6 miles long, from 1 mile to  $1\frac{1}{4}$  miles wide, and 919 feet (280.1 m.) high. The northwestern side of the island is bold and steep-to, but on the southeastern side there is a coral reef extending off for a distance of 600 yards. The climate is very dry, little rain falling.

The eastern point of the island should be given a good berth on account of Le Mouton Rock, with 5 feet (1.5 m.) over it, lying 600 yards off, and on which the sea generally breaks.

The channel between Desirade and Chateaux Point is frequently used by vessels bound to the northward. The Desirade shore should be kept close aboard.

**Current.**—After strong easterly winds there is a westerly current of 2 knots and upward off Colibris Point.

**Water** is only to be obtained from a deep ravine on the northeastern side of the island.

**Grande Anse**, standing on the southeastern side, is the principal town of Desirade. In 1924 this town was destroyed by fire. Small vessels can pass through a cut in the reef and find sheltered anchorage inside, and in fine weather larger vessels may anchor outside in 5 fathoms (9.1 m.) of water with the church bearing north, but the soundings are irregular.

**Mahault Bay**, near the eastern end of the island, is a similar small reef harbor for coasters. The Government has established here a leper hospital.

**Galet anchorage** ( $16^{\circ} 18' N.$ ,  $61^{\circ} 06' W.$ ; *H. O. Chart 1082*).—There is good anchorage under the southwestern end of the island in 5 fathoms (9.1 m.) of water, with two rocks off Colibris Point in range, bearing  $162^{\circ}$ , and a remarkable tree in line with a detached house, on the beach near the middle of the bay bearing  $88^{\circ}$ , but this anchorage is frequently visited by a double swell from the north and south, rendering communication with the shore difficult.

Under no circumstances should the depth be shoaled below 5 fathoms (9.1 m.) because of the numerous coral heads almost awash.

**Soundings.**—From about the meridian of the center of Desirade the soundings of more than 90 fathoms (164.5 m.) on the edge of the bank decrease rapidly westward, until midway between Desirade and Petite Terre, there is only 10 and 12 fathoms (18.3 and 21.9 m.) water. The water is here much discolored, showing in light and dark patches for a considerable distance, and the bottom can be distinctly seen. The depth between Desirade and Petite Terre varies from 9 to 15 fathoms (16.5 to 27.4 m.). About midway between Chateaux Point and the southwestern end of Desirade the depth is upward of 188 fathoms (343.8 m.).

**PETITE TERRE** ( $16^{\circ} 10' N.$ ,  $61^{\circ} 07' W.$ ; *H. O. Chart 363*) is the name given to two low, sandy islets, separated by a narrow cut, lying southeastward from Chateaux Point. The northeastern islet is called Terre d'en Haut; the southwestern one Terre d'en Bas, 39 feet (11.9 m.) high at its eastern end. They are mostly covered with vegetation and have a narrow sand beach along the water's edge. The inhabitants are mainly fishermen.

**Petite Terre Light**, fixed white, 108 feet (32.9 m.) above high water, visible 5 miles, is exhibited from a gray cylindrical tower on a square base, the whole 75 feet (22.9 m.) high, 200 yards from the eastern end of Terre d'en Bas. (See Light List.)

**Dangers—Baleine du Sud Rock.**—A coral bank extends 400 yards from the east side of Terre d'en Haut. Baleine du Sud, 200 yards long, mostly covered, but 3 feet (0.9 m.) above water at its extremity, lies nearly  $\frac{1}{2}$  mile southwestward of the light. Baleine de l'Ouest, 5 feet (1.5 m.) above water, lies 400 yards west of the west end of Terre d'en Bas, and from it a bank with depths under 5 fathoms (9.1 m.) extends northwestward two-thirds of a mile.

**Shoal.**—A shoal patch of  $4\frac{3}{4}$  fathoms (8.7 m.) lies nearly 1 mile south from the western end of the island.

**Caution.**—Because of the irregularity of the depths in the vicinity of Petite Terre, vessels should give these islands a berth of at least 2 miles in passing them.

**Vaisseaux Bank** ( $16^{\circ} 08' N.$ ,  $61^{\circ} 17' W.$ ; *H. O. Chart 363*), about 9 miles westward of Petite Terre and southward of Port St. Francois, Guadeloupe, is an bank with as little as 6 fathoms (11.0 m.) of water on it.

**MARIE GALANTE ISLAND** ( $15^{\circ} 56' N.$ ,  $61^{\circ} 17' W.$ ; *H. O. Charts 363 and 532*) under the government of Guadeloupe, lies 13 miles eastward of the Saintes, in the channel between Dominica and Guadeloupe, 16 miles north-northeastward of the former and 15 miles southward of the eastern end of the latter. The area of the island is about 65 square miles, and its population about 17,000. Its shape is nearly oval, being 10 miles long north and south and about 8 miles east and west. It is of moderate elevation and rises gradually from the south toward its northeastern side where the elevation is 672 feet (204.8 m.), its general appearance being flat and low. The southern and eastern shores are dangerous, being skirted by a reef to the distance of from 2 to 3 miles. The western side is comparatively clear and affords anchorage off almost all parts; the soundings generally are regular and gradually diminish toward the shore, but there are patches, and attention to the lead is required.

**Grand Bourg** ( $15^{\circ} 53' N.$ ,  $61^{\circ} 19' W.$ , *Plan on H. O. Chart 532*), the principal town of Marie Galante, is located at the south-

western extremity of the island. The harbor is formed by an opening in the coral reef and is very small. The church steeple is the most prominent landmark but Roussel Mill Chimney is a useful mark in the vicinity.

**Grand Bourg Light**, fixed white, 46 feet (14.0 m.) above high water, visible 7 miles, is exhibited from a mast east of the fort. (See Light List).

**Entrance range.**—Grand Bourg Light, in range with the above-mentioned church steeple bearing  $61^{\circ}$ , leads inside the reef in not less than 15 feet (4.6 m.) of water.

**Anchorage.**—The best anchorage inside the reef is to the south-eastward of the entrance range in from 12 to 13 feet (3.7 to 4.0 m.). Ships should moor bow and stern.

The outer anchorage is on the entrance range in  $8\frac{1}{2}$  fathoms (15.5 m.) of water, as closer in the vessel would roll considerably.

**Grand Bourg**, the seat of the local government of Marie Galante, has a population of about 7,000. There is a landing pier, at which landings are always possible.

**Saint Louis Bay** ( $15^{\circ} 57' N.$ ,  $61^{\circ} 20' W.$ , *H. O. Chart 532*), on the northwest side of Marie Galante, is contained between Pointe Folle Anse on the southwest and Pointe du Cimetiere on the northeast. The holding ground is very good, although a little roll is experienced with northeast winds. The most convenient anchorage ground is with the only street in the town (running at right angles to the beach) bearing  $90^{\circ}$  true, in line with Bon factory chimney, anchoring in accordance with draft.

**Saint Louis**, with a population of about 4,000, has cable communication with Pointe à Pitre. Customs clearance must be obtained at Pointe à Pitre. Water, meat, and vegetables may be purchased in reasonable quantities.

**Vieux Fort** is a small village of little importance near the north-western end of the island. Abreast of it is a small islet of the same name showing a few feet above water, with a 15-foot (4.8 m.) channel between the islet and the mainland.

**Directions.**—Coming from the northward give Vieux Fort Islet and Cimetiere Point a berth of a mile, and after passing the latter a vessel may haul in for the anchorage at St. Louis. From Pointe Folle Anse to the southward the coast should not be approached within a mile, and, as before observed, the southern end of the island is very dangerous and should not be rounded within a distance of 3 miles.

**Anchorage** in 5 fathoms (9.1 m.) of water will be found  $\frac{1}{2}$  mile offshore, with Vieux Fort Islet bearing  $43^{\circ}$  at the same distance.

**A shoal**, with  $2\frac{3}{4}$  fathoms (5.0 m.) of water, extends  $\frac{1}{4}$  mile northward of this islet, with 5 fathoms (9.1 m.) about 1,500 yards  $347^{\circ}$  from the islet.

**North Point** ( $16^{\circ} 00' N.$ ,  $61^{\circ} 07' W.$ , *H. O. Chart 363*) is the most northerly point of Marie Galante, being  $1\frac{3}{4}$  miles north-eastward of Vieux Fort Islet. From North Point the coast trends southeasterly for 6 miles, is steep-to, and continuously cliffy.

**Capecterre.**—From the southeastern point of the island the coast trends southwesterly for  $2\frac{1}{2}$  miles to Capecterre, which has a small reef harbor where coasters load sugar.

**Capecterre Light**, fixed white, 26 feet (7.9 m.) above high water, visible 3 miles, is exhibited from a mast about 550 yards eastward of the church.

**LES SAINTES** (*H. O. Chart 362*), so called from their having been discovered on All Saints Day, form a group of islands attached to the Government of Guadeloupe, and lie in the channel between Guadeloupe and Dominica, from both of which they are separated by clear and deep channels. They occupy a space 5 miles east and west by 3 miles in breadth.

Terre d'en Haut, or St. Peter, 1,036 feet (315.7 m.) high, the largest and easternmost of the group, is separated from Terre d'en Bas, or St. Paul, the westernmost, by a channel  $\frac{1}{2}$  mile wide, navigable for vessels of any size. There is but little vegetation on the islands. The inhabitants are skillful fishermen and boatmen; population, about 1,900.

**Tides.**—It is high water, full and change, at this group at 6h. 45m.; the rise averages about 2 feet (0.6 m.), but it is much influenced by the wind.

**Water** is scarce, people generally depending on rain water, and the fall of rain is less than in the neighboring islands.

**Provisions**, consisting of fresh meat, fish, and bread, are obtainable, but fresh vegetables must be obtained from Guadeloupe.

**Terre d'en Bas (St. Paul) Island** ( $15^{\circ} 51' N.$ ,  $61^{\circ} 38' W.$ , *H. O. Chart 362*) is about 2 miles in diameter and rises to a height of 931 feet (283.8 m.). Its shores are slightly indented and are free of dangers to within 200 yards.

There is anchorage, but only in fine weather, on the western side of Terre d'en Bas, just to the northward of West Point or Gros Cap, the southwestern extremity; and on the eastern side of the island there are two small coves convenient for droghers.

**Pate Island**, about 40 feet (12.0 m.) high, is located about a quarter mile off the north coast of Terre d'en Bas. It is bold and steep-to on its eastern side, but is foul on its western side to nearly midway between it and Pate Point, at which distance is a shoal of 15 feet (4.8 m.), thus contracting the passage between them to the breadth of 200 yards. By slightly favoring the shore of Terre d'en

Bas a vessel may run, if necessary, through this channel and have not less than 6 fathoms (11.0 m.) of water.

**Augustin Islands** consist of a group of large and steep rocks, unequal in height. About 200 yards westward is a submerged rock with 2 feet (0.6 m.) of water on it.

**Southwest Channel.**—The passage between Terre d'en Bas and Augustin Island is called Southwest Channel. It is  $\frac{1}{2}$  mile wide and, with the exception of the submerged rock mentioned above, free from dangers.

**Range.**—The southeastern extremity of Cabrit Islet, in range with Boisjoli Point  $42^\circ$ , leads through the midchannel.

**Sow (Coche) Island** is a low, narrow island 800 yards long separated from Augustin Islands by a narrow passage called Soufflier Passage.

**Grand (St. John) Island**, 551 feet (167.9 m.) high, lies  $\frac{1}{2}$  mile eastward of Sow Island from which it is separated by Dames Passage; 200 yards from its eastern end is a rock with 3 feet (0.9 m.) of water over it and from its western point extend a series of sharp rocks, called Les Quilles.

**TERRE D'EN HAUT** ( $15^\circ 52' N.$ ,  $61^\circ 35' W.$ , *H. O. Chart 362*).—From the western extremity of the island, which is composed of large blocks of earth, the south coast of the end tends in a generally easterly direction  $1\frac{3}{4}$  miles to Point Rodriguez. There is one bay halfway between the points, where vessels may anchor in moderate depths and where landing may be made in fine weather.

**Redonde Island** is an almost perpendicular rock situated about  $1\frac{1}{4}$  miles eastward from Boisjoli Point, 300 yards from the southern point of Terre d'en Haut. Between Redonde Islet and Boisjoli Point, a bank with depths under 4 fathoms (7.3 m.) extends 400 yards offshore.

**Great Clay Channel**, between Grand Islet and Redonde, is free of danger, but the 10-foot (3.0 m.) and 28-foot (8.5 m.) patches westward of the latter should be given a berth.

**Pontpierre Rocks** are three large rocks 100 to 130 feet (30.5 to 39.6 m.) high which form the southeastern side of Pontpierre Bay.

**Morel Point** is the most northern point of Les Saintes. South of it is Mount Morel, 426 feet (129.8 m.) in height, which separates Pontpierre Bay from Marigot Bay.

**Le Caille**, a rock with 12 feet (3.7 m.) of water on it, which breaks when the sea is at all rough, is 100 yards  $32^\circ$  from Portail Point (at the foot of the hill surmounted by Fort Napoleon).

**BOURG DES SAINTES HARBOR** ( $15^\circ 52' N.$ ,  $61^\circ 35' W.$ , *H. O. Chart 362*) is on the west side of Terre d'en Haut, sheltered

completely from the trade winds, but only partially so from the sudden shifts of wind to west and northwest. The harbor and its approaches are comprised between Point Portail on the northeast and Sugarloaf on the southwest, the anchorage being in the bay contained between Point Mire on the north and Red Head on the south, 1,200 yards apart. From the line joining these two points the bay recedes eastward 600 yards to the town of Bourg des Saintes.

**Depths.**—The harbor has depths both in the approaches and the anchorage of  $7\frac{1}{2}$  to 16 fathoms (13.7 to 29.3 m.).

**Cabrit (St. George) Islet** serves as a quarantine station. There is also a penitentiary on it. Vessels in quarantine anchor here, abreast of the cove, with the southern point of the islet, bearing about  $111^\circ$ , in 11 fathoms (20.1 m.) of water, with a bottom of sand and shell. The southern point, known as Sable Point, is made prominent by Fort Louis, 262 feet (80.0 m.) above the sea.

On the north and northwest side of the island there are a few shallow spots which can be avoided by not approaching the coast closer than 300 yards.

**Red Head**, red in color, and crowned by an old fort, is a point situated half a mile eastward from the headland Sugarloaf, and between them the shore is fronted by a shoal bank extending off 100 yards.

About 1,000 yards eastward of Red Head there is a conspicuous cross standing on a hill to the eastward of the cable hut.

**Whale Channel**, between Terre d'en Haut and Cabrit, is about 400 yards wide, with a depth of from 10 to 18 fathoms (18.3 to 32.9 m.).

**Dangers—Whale Shoal.**—Nearly in the center of the entrance is Whale Shoal, a rocky patch, on which there is only 2 feet (0.6 m.) of water. It is steep-to and lies 700 yards  $259^\circ$  from Portail Point.

**Whale Rock (La Baleine)** is 8 or 10 feet (2.4 or 3.0 m.) above water and lies somewhat more than 200 yards from the northwestern shore of Terre d'en Haut.

**Ranges.**—Boisjoli Point kept between Sandy (Sable) Point and Sugarloaf bearing  $223^\circ$ , will lead between Whale Rock and Whale Shoal.

Bourg des Saintes Church, open southwest of Mire Point, bearing  $155^\circ$  leads southwest of the above dangers.

**Sugarloaf Passage** lies between the southern point of Cabrit Islet and Red Head, both of which points are steep-to and clear of danger. Sugarloaf Passage is convenient for leaving Bourg Anchorage.

**A coral shoal**, about 100 yards in diameter, on which there is 7 feet (2.1 m.) forms an obstruction in this channel. The water does not usually break on this shoal.



**Danger Bearing.**—Bourg des Saintes Church bearing less than 90° will lead to the southward of this shoal.

**Anchorage.**—There is fine anchorage according to draft abreast the town in the bight between Red Head and Mire Point. Care must be taken not to anchor on the telegraph cable, whose course through the harbor is shown on the chart.

The quarantine anchorage is off Cabrit Island.

For vessels not wishing to enter the harbor, good anchorage may be found between the Sugarloaf and the southwestern side of Cabrit Island in 11 fathoms (20.1 m.) of water.

**Directions.**—Vessels bound into the harbor of Terre d'en Haut by the northern channel may enter by either the west or east passage. The former is the best, except with the wind to the southward of east, when the latter may be taken with advantage.

By the western passage, which is nearly 400 yards wide, having passed the northern end of the island at the distance of about  $\frac{1}{2}$  mile, steer to the westward until the church is open from Point Mire. Steer in on this course 155°, which will clear Whale Shoal and Whale Rock. A vessel may then haul up for the passage and anchor as convenient off the town, about 300 yards from the shore, with Whale Rock just open of the land.

By the eastern passage steer as above directed until Boisjoli Bluff is seen between the Sugarloaf and Sandy Point, 222°. This mark clears Le Caille Rock and leads through the passage between the Whale Rock and shoal. When the church in the town opens out and head up for anchorage.

Leaving the anchorage it will be better to take the Sugarloaf Passage, passing either to the northward or southward of the 7-foot (2.1 m.) patch. In the former case, stand to the northwestward until the southern side of the Pate Islet is in range with Pate Point, which mark will lead 100 yards north of the shoal.

In the latter case, stand out with the church on a 90° bearing: when the northwestern hill of Cabrit is open of Sandy Point you will be westward of the patch.

**BOURG DES SAINTES** (15° 52' N., 61° 35' W.) has communication with Guadeloupe by telephone and telegraph. A doctor from Basse-Terre visits the town every two weeks. The mail is carried to Basse-Terre once a week.

**DOMINICA** (*H. O. Chart 1318*), a part of the British West Indies is somewhat oblong in shape, 27 miles in length, north-north-west and south-southeast: its extreme breadth is 13 miles, its extreme northern end being a little over 2 miles and the southern portion 6 miles in breadth, and it contains an area of about 290 square miles. It is of volcanic origin, with lofty, rugged mountains running through the center of the island from north to south, the highest of

which. Diablotin, 9 miles from the northern point, is 4,747 feet (1,446.9 m.) above the sea and most conspicuous. Trois Pitons and Mount Miestrin, respectively, 4,672 and 3,891 feet (1,424.0 and 1,186.0 m.) in height, lying in a northwesterly direction about 5 miles from the town of Roseau, are the second principal features of the mountain range, which continues irregularly to the southern point, varying in height between 2,000 and 4,000 feet (609.6 and 1,219.2 m.). The highest mountains are only seen on the average twice a month.

Soufriere, the southern bay and valley of the island, has several openings from which sulphur, in large quantities, can be obtained. In the Roseau Valley there are several boiling springs, the principal one being 4 miles from the sea and near the Wotten Waven estate.

There are several good but open roadsteads on the western side of the island, the principal of which is Roseau, the capital of the island.

**Climate.**—The dry season (February and March) lasts only for about six weeks; in the remaining part of the year much rain falls. The greatest rainfall is in August and September, and during these months thunderstorms are frequent and violent. The minimum temperature is 75°, maximum 90°; the latter is experienced for fully three months in the year. The annual rainfall at Roseau is about 80 inches; in other parts of the island it is even more. The southern part of the island is healthful, mild fevers alone prevailing as in other healthful parts of the West Indies. Prince Rupert Bay and the northeastern part are considered unhealthful. (See Meteorological Tables, Appendix IV.)

**Hurricanes.**—Dominica is occasionally visited by severe hurricanes; the last one occurring in 1916.

**Caution.**—Vessels sailing under the lee of Dominica should be on their guard against the heavy squalls which come off the high land and through the deep valleys, blowing with great force during the strong trades. Off Soufriere Bay and Layou Valley are the two most dangerous places. During the light trades calms are frequent.

**Tides.**—The mean high water interval at Roseau is 1 hr. 30 min.; mean range of tides 1.2 feet (0.4 m.); spring range 1.6 feet (0.5 m.).

**Tidal Current.**—To leeward of the island no dependence can be placed on the turn of the tide. For several days the set may be north or south, with the direction of the coast, the strength in some places being 2 miles an hour, and within a distance of 10 miles the set may be quite in opposite directions. On the windward side the flood and ebb are regular. Off Point a Peine the flood runs with a velocity of 1½ miles per hour. Off the northeastern part of the island the flood attains a velocity of 2 miles per hour; but the ebb, only ½ mile an hour, is hardly perceptible.

**Population.**—The population of the island at the end of 1926 was 39,879.

**WEST COAST—Cachacrou or Scots Head** ( $15^{\circ} 13' N.$ ,  $61^{\circ} 23' W.$ , *H. O. Chart 1318*) the southwestern point of Dominica, a small promontory 234 feet (71.3 m.) in height and connected to the island by a narrow neck, is a conspicuous object, and when seen from the north or south clear of the land appears as an island. About  $268^{\circ}$ , 335 yards from the northern part of the head, is a rock with 7 feet (2.1 m.) on it at low water. Scots Head should not be approached nearer than  $\frac{1}{2}$  mile.

**Soufriere Bay** is northward of Scots Head and  $1\frac{1}{2}$  miles wide. This can not be recommended as an anchorage, as it is very steep-to.

**Point Michelle.**—On the point is a well-built church, with a large conspicuous cross south of it. Off this point, with the church southward of  $88^{\circ}$  and 300 yards offshore, a vessel may anchor in from 5 to 8 fathoms (9.1 to 14.6 m.). Care must be taken to let go the anchor smartly, as the water deepens so suddenly that drifting a few hundred feet will change the depth from 10 to 30 fathoms (18.3 to 54.9 m.).

**ROSEAU ROADS** ( $15^{\circ} 17' N.$ ,  $61^{\circ} 24' W.$ , *H. O. Chart 513*) is an open roadstead on the southwestern coast of Dominica.

**Depths.**—The 100-fathom (182.9 m.) curve is only 1,000 yards off the town. It then shoals very rapidly until 100 yards off there is only 5 fathoms (9.1 m.).

**Aspect and landmarks.**—The town stands on one of the few sloping points found on the coast of Dominica and immediately south of the Roseau River. The tableland of Morne Bruce 475 feet (144.8 m.) in height dotted over with old military buildings, overlooks the town. Fort Young with a conspicuous flagstaff on its western corner and the conspicuous square-built courthouse, are slightly higher than the other buildings in the southern part of Roseau. The spire of the Roman Catholic Cathedral is the most prominent object and is distinctly seen when approaching from either the north or south. The spire of the Wesleyan Church is whitewashed and is readily visible.

**Roseau Harbor Lights.**—A fixed red light, 64 feet (19.5 m.) above high water, visible 6 miles, is exhibited from a white stone pillar close to the flagstaff of Fort Young.

On the head of the landing pier is a light showing red to seaward and white to the land.

**Anchorage.**—Anchorage off Roseau can be had opposite Fort Young, in from 12 to 15 fathoms (21.9 to 27.4 m.) of water. The precaution of letting go the anchor smartly must be strictly ob-

served, as the distance between the depth of 9 and 30 fathoms (16.5 to 54.9 m.) is only about 150 yards. The anchorage off the town can not be recommended, as it is very steep and there is scarcely room for a small vessel to swing toward the beach and on account of old moorings which are lying in this part of the roads.

**Storm signals** are exhibited from the flagstaff at Fort Young as follows:

**Cautionary signal:** One gun, or rocket, is fired; and by day a red flag with a black center is hoisted, and by night a red light.

**Danger signal:** Two guns, or rockets, are fired in succession; and by day two red flags with black centers hoisted, and by night two red lights.

**Canceling signal:** On improvement of weather conditions, after either the cautionary or danger signal has been made and it is considered that the hurricane has passed Dominica, a blue flag is hoisted.

**ROSEAU** (15° 17' N., 61° 24' W., *H. O. Chart 513*), the principal town of Dominica and the seat of the government of the island, had a population in 1928 of 6,000.

The United States is represented by a consular agent.

**Piers.**—A pier for the use of the mail steamers extends in a southwesterly direction from the center of the town. The Bell Jetty Pier, about 170 feet in length, connects the rock Table de Diable with the shore southeastward of the mail steamer pier. An iron framework pier, with concrete head, has been built extending 100 feet in a southwesterly direction from the shore, at a distance of 175 yards southeastward of the base of the town pier. There are depths of about 12 feet (3.7 m.) alongside the outer end of the piers. The piers are provided with cranes with capacity to about 5 tons. All cargo is handled from ship to shore by means of 1-ton chnoe lighters.

**Fuel.**—There is no coal or fuel oil available. A small amount of gasoline is on hand at a high price.

**Supplies.**—No ship chandler or engineers' supplies may be obtained. Almost all kinds of commissary supplies are plentiful.

Fresh water for drinking and boiler purposes is plentiful. It is transported to the ship by hose or cask. Application for fresh water should be made to the town clerk.

**Communication.**—There is telephonic communication with Portsmouth; the system extends to other parts of the island. Roseau has steamer communication with New York and the islands of the West Indies.

**Radio.**—A radio station, call letters GOD, is located on the northern part of Woodbridge Bay. The station has two masts, each 200 feet (61.0 m.) in height.

**The sanitary** condition of the town is good.

**Hospital.**—There is one hospital; it is Government owned. Seamen are admitted.

**Woodbridge Bay** (15° 18' N., 61° 24' W., *H. O. Chart 513*) is 1¼ miles wide, and lies between Roseau on the south and the high land of Morne Daniel on the north. A conspicuous row of palms, running in an easterly direction and leading up from the Goodwill estate, which is in the southern part of the bay, is an excellent guide. The table-lands at the back of the bay, intersected by ravines, are much lower than Mornes Bruce and Daniel. Of the northern point of the bay, rocks extend for 200 yards, and, on a coast so steep and free from dangers, show out conspicuously.

**Anchorage** can be obtained in from 10 to 12 fathoms (18.3 to 21.9 m.) 300 yards from the beach, with the Goodwill black chimney (there is also a gray chimney on the same building) just open to the southward of the conspicuous row of palms bearing  $106^{\circ}$ , and Scott Head touching the shingly point of Roseau River.

**Water** may be obtained from a river in Woodbridge Bay, but the beach being rough and stony it is attended with much inconvenience.

**Layou River** ( $15^{\circ} 23' N.$ ,  $61^{\circ} 26' W.$ , *H. O. Chart 1318*).—The coast from Morne Daniel runs in a north-northwesterly direction, with slightly indented bays. Layou River, the largest in the island, is just 6 miles from the shingly point of Roseau River; when seen from the westward the entrance may be easily distinguished by the lowness of the land. The source of the river lies near the foot of Morne Couronne 2,412 feet (735.2 m.) in height, which is comparatively low when seen with Diablotin to the north and Trois Pitons to the south.

**Good anchorage** for droghers can be obtained north or south of the entrance to the river, 400 yards from the shore, the depths being 8 and 10 fathoms (14.6 and 18.3 m.). The northern anchorage is most frequented by small craft shipping wood or sugar. In a southwesterly direction from the entrance of the river the water is very deep, and at anchoring distance offshore there are 40 fathoms (73.2 m.). Wood in large quantities is shipped from this river.

**Grand Savanna** is the largest sloping piece of land on the western side of the island. This land is generally extremely parched in appearance, with little or no cultivation.

**Anchorage**.—The western point of Grand Savanna brought to bear  $66^{\circ}$ , distant about 600 yards, and in from 10 to 20 fathoms (18.3 to 36.6 m.), rock and sand, is the best anchorage ground. Closer inshore there are several patches of mushroom rocks, which a vessel's cable is likely to foul and be difficult to recover.

**Wood and water**.—A small river immediately north of Grand Savanna is favorable for watering, and wood can be obtained at moderate prices.

**Barber Block** is a conspicuous hill 1,234 feet (373.1 m.) in height 5 miles to the northward of Grand Savanna. When seen from the north or south it is, as its name denotes, like a barber's block, the facial part being the summit and shoulders of the hill. From a westerly view it appears as a sharp cone. See view on Hydrographic Office Chart 513.

**Prince Rupert Bay** ( $15^{\circ} 35' N.$ ,  $61^{\circ} 28' W.$ , *H. O. Chart 513*) is located in the bight between Rollo Head and Prince Rupert Bluff. It affords the best anchorage in Dominica Island. In the northeastern part of the bay and facing the beach is the small and dilapidated town of Portsmouth. Prominent landmarks when approach-

ing the head of the bay are: The Roman Catholic Church, with its tall spire, standing a few hundred feet from the shore; the Methodist Chapel, a white building, is  $\frac{1}{2}$  mile inland and on the foot of a long, low spur and a red suspension bridge over the Indian River. Morne au Diable, 2,917 feet (889.1 m.) high, stands to the north-eastward of the bay, the spurs from its summit meeting those from Morne Diablotin, at the back of the bay, in a neck about 600 feet (182.9 m.) high.

A smokestack forming a good mark stands on the shore of the bay, with the Catholic Church tower bearing  $0^{\circ}$  distant nearly  $\frac{1}{2}$  mile.

If bound to this bay from the eastward, it will be better to pass to windward of the island and round its northern end to avoid the risk of being becalmed under the highlands.

**Prince Rupert Bay Wharf Light.**—A fixed red light, 20 feet (6.1 m.) above high water, visible 3 miles, is exhibited at a point 25 feet from the outer end of the new concrete wharf 110 feet long, situated at the southern end of Portsmouth. There is a depth of 15 feet (4.8 m.) at the outer end of the wharf.

**Anchorage.**—The most convenient anchorage is in about 8 fathoms (14.6 m.) sandy bottom, with the Roman Catholic Church bearing  $49^{\circ}$  and the extremity of Prince Rupert Bluff  $302^{\circ}$ . North or south of this position the anchorage is good, but not so convenient for obtaining wood and water.

**Storm signals** are exhibited from the police station at Portsmouth as at Fort Young. See page 185.

**PORTSMOUTH** ( $15^{\circ} 35' N.$ ,  $61^{\circ} 38' W.$ , *H. O. Chart 513*), the small town at the head of the bay is one of the best places on the island to obtain wood and water. A market is held in the town on certain days and is usually well supplied with fresh provisions.

**Prince Rupert Bluff** ( $15^{\circ} 35' N.$ ,  $61^{\circ} 30' W.$ , *H. O. Chart 513*) is a steep bluff surmounted by two remarkable hills, known as the East and West Cabris, 473 and 623 feet (144.2 and 189.9 m.) high, respectively. To vessels coming from northward or southward they appear as islands, but they are joined to the shore by a neck of low, swampy ground. This prominent peninsula forms the northern side of Prince Rupert Bay. See view on Hydrographic Office Chart 513.

**Douglas Bay** is directly northward of Prince Rupert Bluff. Small vessels visit this place for firewood. Anchorage may be found in from 5 to 8 fathoms (9.1 to 14.6 m.), sandy bottom, 300 yards offshore.

**North Coast—Cape Capuchin (Melvill)** ( $15^{\circ} 38' N.$ ,  $61^{\circ} 28' W.$ , *H. O. Chart 1318*).—From the northern point of Douglas Bay to Cape Capuchin (Cape Melvill), the northwestern point of Dominica, the coast is bold and steep-to.

**Point Jaquet** lies 2 miles eastward of Cape Capuchin. The coast between is a bold and lofty cliff 1,000 feet (304.8 m.) high.

**La Soye Point.**—The coast from Point Jaquet to the southeastward continues its rugged character until in the neighborhood of La Soye Point, where landing may be had. A small anchorage of 4 fathoms (7.3 m.) is formed by La Soye Point and Reef stretching to the northwestward, but is very confined, scarcely allowing a small schooner room to swing at her anchors; vessels are steadied by hawsers made fast to the shore. A pier is built inside the point and the landing is easy.

**Crumpton Point**, 1 mile south-southeastward of La Soye Point, is the northeastern point of the island.

**EAST COAST.**—The character of Dominica in the northeastern quarter presents a distinct contrast when compared with any other portion. The land rises from the sea less abruptly, the soundings off the coast showing a continuation of this gradual slope, 100 fathoms (182.9 m.) being found  $3\frac{1}{2}$  miles offshore. Mornes Concorde and Grand Bois, in the northeast, are, respectively, 2,106 and 3,034 feet (641.9 and 924.7 m.) in height, the latter being 3 miles from the coast.

**Captain Scott Rock**, the only danger off the windward side of the island, is under water, and lies 500 yards from the shore, 2 miles  $329^\circ$  from Pagoua Point. There are 16 to 18 fathoms (29.3 to 32.9 m.) on the eastern side of the rock. The sea breaking heavily over it in strong trades.

**Pagoua Bay.**—The northern shore of this bay, known as North End, trends round to the north and west to Petit Marigot, one of the few landing places on the windward side of the island.

**St. David Bay** lies midway between the northern and southern points of Dominica. On its southern side is a small rocky islet which, with an adjacent promontory, affords shelter for droghers. With a northerly wind a heavy sea sets in, making it difficult for vessels to put to sea. The anchorage is only safe with the wind south of east-northeast. In the valley is the well-cultivated estate of Castle Bruce. All its produce is shipped in droghers, which anchor under the rocky islet. A conspicuous range, about 2,400 feet (731.5 m.) high, rises over St. David Bay and runs to the northward almost parallel to the coast for nearly 5 miles, terminating near Pagoua Point.

**Point a Peine** is one of the most eastern points of the island. On either side is a deep indentation known as Grand Marigot on the north and Petit Soufriere on the south. Over Point a Peine is a sharp hill which rises to the height of 1,044 feet (318.2 m.). The

point forming the southern part of Petit Soufriere Bay is Rosalie; southward of this is an estate of the same name, at the foot of a deep valley, which commences but a few hundred feet from the top of one of the highest mountains.

**Point Mulatre**,  $6\frac{1}{2}$  miles southward of Point a Peine, is the commencement of a regular line of cliffs. La Plaine, on which stands a Roman Catholic Church, is on the most level part of this land and is distant 3 miles from Point Mulatre. Grand Soufriere Range, 3,554 feet (1,083.5 m.) high, rising over Point Mulatre and La Plaine, is connected by ridges with the main chain of mountains, which runs through the island.

**Morne Paix Bouche**, 1,585 feet (483.1 m.) high, rising over the dark, steep, and rugged cliffs, is the continuation of a sharp and defined ridge of hills on the southeastern part of the island, the highest point being 3,277 feet (998.8 m.) above the sea. The coast here is very steep, the depth of 100 fathoms (182.9 m.) being found at little more than  $\frac{1}{2}$  mile from the shore.

**Grand Bay** is the principal and safest anchorage on the windward side of the island. The largest and best cultivated estate near the bay is Geneva, with a water mill  $\frac{1}{2}$  mile from the beach. Grand Bay terminates in a comparatively low point called Carib. Under this point and close inshore small vessels may anchor in from 5 to 10 fathoms (9.1 to 18.3 m.) and find shelter during the greater strength of the trades when the wind is north and east. When the trade becomes slack and inclined to veer round to the southeastward, the anchorage is not safe.

**Morne Fous**, 2 miles east of Scots Head, is a remarkable conical cliff, rising to the height of 1,251 feet (381.3 m.). When viewed with the higher land as a background, the steep cliff which falls almost perpendicular to the sea has a most striking appearance, and when seen clear of the land it appears as a cone. The eastern extremity of this cliff is known as Point des Fous.

**Martinique Passage** (*H. O. Chart 2318*), 22 miles wide, separating Dominica from Martinique, has depths varying from 200 to 1,200 fathoms (365.8 to 2,194.6 m.). The current generally sets to the westward.

**Banks** with 43 and 45 fathoms (78.6 and 82.3 m.) are situated about 20 miles eastward of the channel fairway.

**MARTINIQUE ISLAND** (*H. O. Chart 1009*) is located between lat.  $40^{\circ} 23' N.$  and  $14^{\circ} 52' N.$ ; long.  $60^{\circ} 49' W.$  and  $61^{\circ} 13' W.$  It was settled in 1635 by the French, to whom it now belongs. Its area is about 385 square miles, one-third of the surface consisting of plains, the rest being mountainous.



This island is very lofty and irregular in height, and may be readily distinguished by three remarkable mountains of different shape, rising far above the general chain which runs through the whole of the island from northwestward to southeastward, and may be seen about 45 miles off. The most northern of these is Mount Pelee, 4,428 feet (1,349.6 m.) above the sea, rising nearly 4 miles to the southeastward of Cape St. Martin, and its summit, when seen from a distance, appears rounded and presents nothing remarkable. The Carbet Peaks, which rise  $3\frac{1}{2}$  miles from the western shore, between the Bays of St. Pierre and Fort de France, are a group of conical peaks, with very steep and abrupt declivities, the most elevated being 3,960 feet (1,207.0 m.) high, but their summits, being generally in the clouds, are seldom visible. At the southeastern end of the island the Vauclin Mountain rises to the height of 1,657 feet (505.0 m.), and has the appearance of a flattened cone. It rises at the eastern end of a chain of hills, which is divided toward the south into two branches, one terminating at Saline Point and the other uniting itself with the steep ridges that command the Bays of Fort de France on the north and Grande Anse du Diamant on the south.

There are numerous streams on the island but only three of them can be navigated by even the smallest craft.

The soil is generally formed of pumice mixed with decayed vegetable matter, the southern part being more fertile than the northern, where the land is barren and rocky. The produce of Martinique is much the same as that of the other Windward Islands.

**Coast line.**—The northeastern and western shores of Martinique are clear, bold, and steep to from the Sugarloaf Rock on the northwestern side of Trinite Bay round to Fort de France, and from Ramiers Islet at the southern side of entrance to Fort de France southeast of Grande Anse du Diamant, but the south, southeast, and eastern shores are irregular, deeply indented, and dangerous, particularly the latter, which is skirted by low islets and reefs, extending about  $2\frac{1}{2}$  miles from the coast, and should be very carefully approached.

**The population** of Martinique in 1926 was 244,482.

**Standard time.**—The standard time adopted in Martinique is that of the 60° meridian, 4h. 00min. slow on Greenwich Civil Time.

**Climate.**—The year is divided in Martinique into three seasons: The cool season, from December to April; the hot and dry season, from April to August; and the hot and wet season for the remainder of the year.

The amount of moisture in the air is very great. The average range of the barometer is from 30.00 to 30.12 inches, but on the approach of a hurricane it has been known to descend as low as 29.53 inches.

At a height of  $6\frac{1}{2}$  feet above the level of the sea the maximum temperature in the shade has been found to be  $95^{\circ}$  F. and the minimum  $68^{\circ}$  F., while the mean yearly temperature is  $79^{\circ}$  F. (See Meteorological Tables, Appendix IV.)

**Winds.**—During the dry season the winds are generally between east and northeast, without varying much either in direction or force; but during the rainy season they are far less regular, varying from east-northeast to west, passing by the south.

**Hurricanes and Earthquakes.**—The rainy or wet season is the most unhealthful season of the year, and also that of the hurricanes, which frequently occur between July and October, and are often accompanied by more or less violent shocks of earthquakes and heavy rollers. Hardly a year passes without earthquake shocks at Martinique.

**Tides.**—The high-water interval at Martinique depends greatly on the strength of the trade winds but, in general is, 3h. 50m., normal mean range 1 foot (0.3 m.); spring range 1.5 feet (0.5 m.). At Havre du Robert, due to the influence of the trade winds, the rise and fall is 2.5 feet (0.8 m.).

**Current.**—The tidal current is entirely influenced by the great equatorial current; consequently near Saline Point on the south and the Perle Rock on the northwestern side of the island the current runs generally to the westward. Upon the western coast, especially abreast St. Pierre, the currents set to the southward. On the eastern side with the wind northeast it runs to the southwest, and with southeast winds to the northwest, and sometimes with a velocity of 3 knots. In the channel between Martinique and St. Lucia the current is frequently imperceptible.

**West Coast—Cape St. Martin** ( $14^{\circ} 52' N.$ ,  $61^{\circ} 13' W.$ , *H. O. Chart 1009*), the northwestern extremity of Martinique is steep-to. The coast trends in a south-southwesterly direction 3 miles and then turns southeasterly.

**Perle Rock**, 85 feet (25.9 m.) in height, is 800 yards off the coast. It is steep-to and may be closely approached on its westward side.

**Le Precheur**,  $2\frac{1}{2}$  miles southward from Perle Rock, is a village where coasters may anchor. Some fresh provisions may be obtained here.

**St. Pierre Roadstead** (*H. O. Chart 1020*) lies between La Mare Point on the north and Carbet Point on the south, the shore between them being low and sandy.

**St. Pierre** ( $14^{\circ} 44' N.$ ,  $61^{\circ} 11' W.$ , *H. O. Chart 1020*) was the largest city in Martinique, with a population of 25,792, and one of the most important commercial cities in the West Indies. On the 8th of May, 1902, by an eruption of Mount Pelee, the city and

its population were destroyed by a wave of asphyxiating and inflammable gas, followed by fire. Sixteen vessels lying in the roadstead were destroyed and sunk. On May 20 a second eruption, followed by a flow of mud and showers of ashes and pebbles, completely buried that portion of the town to the northward of Mouillage River and threw down all the walls in the city. The destruction was complete.

Soundings taken after the earthquake for the recovery of the cable show that the depths of the bottom have not changed even in those portions where the cable had been broken or bent, due to previous existing inequalities. With the exception of wrecks in St. Pierre Roads it may be taken for granted that navigation in the vicinity of Martinique has not been affected by the volcanic eruptions of 1902.

**Landmark.**—The monument of the Virgin Mary on St. Marthe Point remains in place and is a square white column twice as high as wide, rounded on top. The cathedral is still a conspicuous object.

**Hospital Cay** is a rocky bank extending 300 yards from the shore and 500 yards southward of Mouillage River. It is 266 yards in length, with 7 to 15 fathoms (12.8 to 27.4 m.) on it, deepening suddenly to 30 fathoms (54.9 m.) on the western side.

**Mooring buoy.**—A mooring buoy is placed about 200 yards westward from wharf northeastward of Place Bertin.

**Anchorage.**—The best anchorage for naval vessels is a little to the southward of St. Marthe Point, about 400 yards offshore, in 20 fathoms (36.6 m.) of water. The bank of soundings extends a little farther offshore here than abreast of the town, is less steep, and is called the Plateau du Carbet.

In approaching the anchorage of St. Pierre, although the vessel may seem to be very close inshore, the anchor should never be let go till the lead shows that the anchorage has been reached. The harbor is encumbered by wreckage and care should be taken not to foul ground tackle.

**The currents** in the offing from St. Pierre Roads generally set to the southward, but a strong northerly current of about 1.6 knots has been encountered just southward of Pearl Rock when about 1,500 yards offshore. According to local reports, fresh southerly breezes had prevailed for several days previously.

**Carbet Village.**—One and a half miles southward from St. Pierre is the village of Carbet, built on the beach in a very picturesque position. It is recognized by a red-roofed church with a white spire. There is a pier at this village.

The coast from St. Pierre to Negro Point is formed by cliffs, intersected by bays frequented by coasters.

**Anse de Case Pilote** is a small anchorage about 4 miles to the northwestward of Negro Point. It is seldom visited except by small vessels.

**Case Navire** is a small bay  $1\frac{1}{4}$  miles to the northwestward of Negro Point, in which there is good holding ground in 8 or 9 fathoms (14.6 to 16.5 m.) of water, about 200 yards from the shore. Care must be taken in standing into the bay, for the bank is so steep that there is a depth of 36 fathoms (65.8 m.) about 200 yards farther out over rocky bottom. The best berth will be found from abreast of the battery to abreast of the westernmost houses. There is a stream of excellent water at the village.

There is a conspicuous white church spire in the village.

**FORT DE FRANCE BAY** ( $14^{\circ} 36' N.$ ,  $61^{\circ} 04' W.$ , *H. O. Chart 1022*) lies between Negro Point and Cape Solomon, the bold headland which forms the northern side of Grande Anse d'Arlet; its width, however, may be more properly confined to the space between Ramiers Islet and the above point,  $3\frac{1}{2}$  miles distant, and from this time it extends eastward about 5 miles. The bottom is irregular, and varies considerably in depth, but its shores are so indented as to afford several secure anchorages against all winds. The passages to them, however, are intricate, and the assistance of a pilot is necessary.

**Depths.**—The bay and also the harbor are available for all classes of vessels. The anchorage for naval vessels is westward of the town, in any required depth.

The harbor and carenage has depths of 6 to 12 fathoms (11.0 to 21.9 m.), and there is anchorage space on either side or southward of the Middle Bank, in depths of 8 to 11 fathoms (14.6 to 20.1 m.) and toward the head of the carenage, the western arm, the depths shoal gradually to about 5 fathoms (9.1 m.) abreast of the dry dock. A pilot is necessary for the harbor.

**Landmarks.**—Two cathedral spires are conspicuous; also a flagstaff on Negro Point and another flagstaff to the eastward. A pier 60 yards long runs out from the shore northwestward of Fort St. Louis. The spire, 1,270 yards northward of Fort St. Louis Light, is useful for a range.

Three radio towers, of which the west tower lies about 900 yards  $88^{\circ}$  from Fort St. Louis Light, are conspicuous landmarks and are visible long before Negro Point or the church spire can be seen. A conspicuous church, remarkable for its white dome, which is 3.3 miles  $346^{\circ}$  from Fort St. Louis Light and whose summit, 90 feet (27.4 m.) high, is elevated 1,000 feet (304.8 m.) above sea level.

**Buoyage.**—The system of buoyage adopted at Fort de France is that all black buoys are to be left on the port hand and red buoys on

the starboard hand on entering; these red buoys have one white horizontal band a little below the top. The buoys which can be left on either side are painted red and black in horizontal bands.

**Caution.**—The positions of the buoys in Fort de France Bay are only approximate.

**Dangers—Ramiers Bank—Gros Ilet Bank** is a shoal situated about 700 yards within the northern extremity of Ramiers Bank, which extends 2 miles northward of Ramiers Islet, off the southern point of entrance to Fort de France Bay; the least water charted on it is  $3\frac{3}{4}$  fathoms (6.9 m.). Between this shoal and the islet the bottom of Ramier Bank is uneven and rocky, the depth varying from  $4\frac{1}{2}$  to 11 fathoms (8.2 to 20.1 m.). The patches are distinguishable by the light color of the water.

**Buoy.**—The shoal is marked by a beacon buoy, painted black and red in bands, surmounted by a sphere, moored on the southern side of the shallow water  $209^\circ$  distant  $1\frac{3}{4}$  miles from Fort St. Louis Light.

**Mitan Bank** is  $\frac{1}{2}$  mile in extent under 10 fathoms (18.3 m.); it lies nearly midway between Gros Ilet Bank and St. Louis Bank. Near its southern extremity is a rocky path of  $4\frac{1}{4}$  fathoms (7.8 m.).

**Buoy.**—The shoal is marked by a conical red and black buoy surmounted by a circular disk which lies 1,800 yards  $215^\circ$  from Fort St. Louis Light.

**Vierge Bank** is a rocky knoll, about 400 yards in extent, with a depth of 9 fathoms (16.5 m.) at about  $\frac{1}{2}$  mile northwestward of Mitan Bank; which should be avoided in coming to the anchorage.

**St. Louis Bank.**—A bank of gravel and rock extends about  $\frac{1}{2}$  mile to the southward and southwest of Fort St. Louis Peninsula with depths of 1 to  $4\frac{3}{4}$  fathoms (1.8 to 8.7 m.). A  $3\frac{1}{2}$  fathom (6.4 m.) spot has been located 1,100 yards  $228^\circ$  from Fort St. Louis Light.

**Buoys.**—The southwestern extremity is marked by a black buoy, No. 1, in 8 fathoms (14.6 m.) of water, about 1,000 yards  $231^\circ$  from Fort St. Louis Light; and the southern extremity by a black can buoy, No. 2, in  $4\frac{1}{2}$  fathoms (8.2 m.), 700 yards,  $159^\circ$  from the same light.

A black conical buoy is moored about 300 yards southwestward of the No. 2 buoy.

On the arrival of mail steamers, a white light is shown from Black Buoy No. 1 moored on the southwest extremity of St. Louis Bank and a red light from Black Buoy No. 2 on the southeast extremity of the same bank.

**Grande Seche.**—From Carriere Point, the east entrance point of Fort de France Harbour, the north shore of the bay trends south-eastward  $1\frac{1}{4}$  miles to Point Sable, Grive Point being halfway be-

tween them. From each of these two points a bank under the depth of 3 fathoms (5.5 m.) extends 1 mile southward. The broader bank from Grive Point takes the name of Grande Seche; that from Point Sable is known as Gamelle Bank.

**Buoys.**—A black buoy is moored in  $4\frac{1}{4}$  fathoms (7.8 m.) near the southern extremity of Gamelle Bank. From this buoy Grande Seche trends westward 1 mile, where there is a depth of  $4\frac{3}{4}$  fathoms (8.7 m.).

A red conical buoy is moored near the southwestern extremity of Grande Seche, 900 yards  $140^\circ$  from Fort St. Louis Light.

Red buoy No. 3 is moored in  $3\frac{1}{4}$  fathoms (5.9 m.) 750 yards  $135^\circ$  from Fort St. Louis Light. This buoy shows a white light when the mail boat is in port.

These last two buoys mark the east side of the channel to the harbor.

**Three-fathom patch.**—Southward 1,700 yards from Fort St. Louis Light and near the west extremity of Grande Seche is a patch of 3 fathoms (5.5 m.).

**Buoy.**—One hundred yards north of the patch is placed a red conical buoy.

**Fort de France Harbor Lights—Negro Point Light.**—A flashing white light, 121 feet (36.9 m.) above high water, visible 17 miles, is shown from a white metal tower with a hexagonal base located on Negro Point. (See Light List.)

**Fort St. Louis Light.**—A fixed red light with white sectors 102 feet (31.1 m.) above high water, visible 6 miles, is shown from a white metal framework structure, 20 feet (6.1 m.) high, located on the southwest part of the fortress. (See Light List.)

A red and white light (read seaward, white toward the shore) is shown from the southern mole in the Carenage.

An electric light is shown from a wharf in the Carenage when mail steamers are expected, or when required.

**Two fixed red range lights** have been established to lead through the channel of the Carenage toward the dry dock.

The front light is exhibited about 30 feet (9.1 m.) above the water from a pole, painted white, surmounted by a triangle.

The rear light is exhibited about 45 feet (13.7 m.) above the water from a pole, painted white, surmounted by a triangle located about 109 yards from the front light.

The lights which are in line bearing about  $2^\circ$  are situated about 130 yards eastward of the eastern side of the dry-dock caisson.

**Anchorage—Harbor.**—The harbor is contained between Fort St. Louis and Carriere Point nearly half a mile farther eastward. The harbor consists of two arms, one, named Bay of Tourelles, extending

northeastward 1,100 yards, the other, named the Carenage, running north, 900 yards. In both arms the depths range from 6 to 10 fathoms (11.0 to 18.3 m.) and in the Carenage the water shoals gradually to 5 fathoms (9.1 m.) abreast the graving dock; a pilot is necessary.

Between the two parts of the harbor a bank extends a quarter of a mile southward from the coal wharf. This bank is being dredged, and in 1919 was dredged to a least depth of  $4\frac{1}{4}$  fathoms (7.8 m.).

**Buoy.**—On the west side of the channel to the Carenage is placed a black conical buoy 300 yards northeastward from Fort St. Louis Light. One hundred yards north of this buoy is a small landing pier.

**Anchorage for naval vessels.**—The anchorage for naval vessels, called Flammands Anchorage, lies westward of the town and is protected by Fort St. Louis on a narrow peninsula which rises abruptly from the sea to a considerable height and separates the anchorage from the harbor and Carenage eastward of it. Having regard to the holding ground, a good anchorage is in 20 fathoms (36.6 m.) with Negro Point Light bearing  $290^\circ$ , Fort St. Louis Light bearing  $67^\circ$ . Smaller vessels can move in closer.

**Signal station.**—There is a signal station on the northern extremity of Fort St. Louis; the International code is used.

**Pilots.**—Pilotage for incoming merchant vessels is compulsory. Pilots should be carefully checked, as their ability has been questioned. It is not, however, required for outgoing ships. Pilot will come on board upon display of the customary pilot flag and will meet ships about 1 mile from the shore.

Pilot boats fly the French pilot flag. Pilotage for naval vessels is not compulsory, but they must pay fees. Pilots will meet vessels. If a pilot is desired, vessels should fly the pilot flag and head toward Fort St. Louis.

**Tides.**—See page 191.

**Directions.**—The approach to the anchorage for naval vessels, southwestward of the town, has no dangers. From about  $\frac{1}{2}$  mile off Negro Point Light course may be steered for Fort St. Louis Light, bearing about  $73^\circ$ , anchoring as requisite.

**At night,** bring the red light on Fort St. Louis to bear about  $73^\circ$ , which being steered for, leads about  $\frac{1}{2}$  mile southward of Negro Point Light, and when the latter light bears  $291^\circ$  anchor in about 15 fathoms (27.4 m.).

**Directions**—The harbor or carenage can only be entered in charge of a pilot, and after pratique has been obtained. The approach from seaward is on either side of Mitan Bank, that to the southward being between the buoy on that bank and the buoys on Gros Ilet Bank and Grand Seches; thence into the harbor between No. 2 black buoy and the buoy on Carriere Point Bank and

as requisite. In ordinary weather a large vessel drawing up to 26 feet (7.9 m.) of water can enter the carenage to coal alongside. To pick up this berth, on passing between black buoy No. 2, and red buoy No. 3, on Carriere Point Bank, at slow speed, steer with the western edge of the graving dock wall in range with Calvara Church steeple, bearing 348°. When Fort St. Louis Light bears 250°, haul to starboard as requisite, and by working the engines lay the ship parallel with the wharves and heading for the Darse des Transatlantiques. This mooring is completed by means of hawsers, paying careful attention to the currents coming from the Bouille Ravine.

The channel northward of Mitan Bank is between its buoy and the black buoy on Fort St. Louis Bank; thence as before.

**At night** lights are exhibited when necessary on the St. Louis Bank buoys and on Middle Bank in the harbor.

**Sailing vessels.**—During the day and in fine weather the harbor is easy of access. Having rounded Cape Solomon, which is steep-to, Fort de France Bay will open, and a vessel may haul to the wind accordingly. Should the wind be to the southward of east, care must be taken to avoid the Gros Ilet Bank (which, however, has 22 feet (6.7 m.) of water on it), the edge of which may be distinctly traced by the discolored water: To windward of the bank the chart does not show less than  $4\frac{1}{4}$  fathoms (7.8 m.), but less water may exist. Fort St. Louis Light bearing northward of 25°, leads eastward of Mitan Bank and buoy. Should the wind be to the northward of east, as is generally the case, a vessel will have to work in, and in doing so can stand boldly in to the northern shore and to the south-eastward, according to her draft. If from the westward, Negro Point may be rounded at the distance of 400 to 600 yards.

**FORT DE FRANCE** ( $14^{\circ} 36' N.$ ,  $61^{\circ} 05' W.$ , *H. O. Chart 1022*), having a population of about 26,400, is situated on the northern side of the bay, about 1 mile eastward of Negro Point, on a low, level plain, bounded on the western side by the Madame River, on the east by the Carenage, and on the north by a canal which forms a communication between them.

The residence of the governor is at Fort de France, but for a part of the year he resides at Belle Vue, on the northern shore of the bay, where the national flag is hoisted during his residence; there is a landing at a small pier at the foot of the cliffs beneath the residence. Besides various educational establishments there is an arsenal at the town.

The United States is represented by a consul and a vice consul.

**Wharves.**—The only wharf is that of the French Company, which has depths of 4 to  $4\frac{1}{4}$  fathoms (7.3 to 7.8 m.) alongside. Other vessels anchor in the harbor and discharge or load cargo from lighters. There are 15-ton open lighters available for this purpose.

**Tugs.**—While there are no tugs available, there are two small steamers, engaged in the island coast trade, that are sometimes used as tugs. They are not high power and are in such a state of repair that they can undertake no towing when the sea is rough. Frequently both are absent.

**Dock.**—The dry dock, at the head of the carenage, has the following dimensions: Length on the blocks, 394 feet; length over all, 420 feet; breadth of entrance, 92 feet; depth over sill, 28 feet (8.5 m.) at high water. (See Appendix II.)



**Repairs.**—The Compagnie Generale Transatlantique maintains repair shops where repairs of all types are undertaken. However, the capacity of the shops are limited in regards to the quantity of work.

**Coal.**—Only coal is private stock maintained by Compagnie Generale Transatlantique at Fort de France. When there is sufficient on hand, up to 500 tons will be supplied to vessels requiring it, preferably by basket at the company's wharf where the depth alongside is 22 to 28 feet (6.7 to 8.5 m.).

**Fuel oil** is not available.

**Supplies.**—All necessary supplies are to be had. Water of an excellent quality may be obtained at a fountain in the Carenage, and two boats can water at the same time, or water tanks may be had. It can also be procured from a watering place near the Madame River, where it is brought to the shore by means of pipes, and with a hose the casks may be filled in the boat. Water may also be obtained alongside the French Line docks.

**Communication.**—Fort de France is normally in regular steamer communication with France, various West Indian islands and New York. Steamers of the Quebec Line call every two weeks. There is communication with Mobile by steamers of the Windward Island Line, and with New Orleans by steamers of the New Orleans and South American Line. It is connected by cable with St. Thomas, Puerto Plata, and Paramaribo. The cables land 250 yards westward from the mouth of the Madame River.

**Radio.**—A radio station, open to the general public at all times when there is no official correspondence, has been established at Fort de France. The call letters are H Z H. (See International List.)

The sanitary conditions of the city are not good.

**Hospitals.**—There are two hospitals—the municipal and the military. The former is recommended for seamen.

**Pratique.**—Vessels can not enter the harbor before obtaining pratique, and the entrance to the harbor may be refused.

**Cohe du Lamentin** ( $14^{\circ} 36' N.$ ,  $61^{\circ} 02' W.$ ; *H. O. Chart 1022*)—**Anchorage.**—There is anchorage in  $6\frac{1}{2}$  fathoms (11.9 m.) to the eastward of Caille Carcasse. The pilots say that ships never swing to the westward, but always lie with their heads between east and northeast.

The bay north of Point Sable has an anchorage in depths of 4 to  $4\frac{1}{2}$  fathoms (7.3 to 8.2 m.).

**Dangers—Monsigny Bank**, with a minimum depth of 2 fathoms (3.7 m.) is about 2,700 yards to the southward of Grive Point.

**Buoy.**—A black buoy is moored in  $2\frac{1}{4}$  fathoms (4.1 m.) on the southeastern edge of the bank. This buoy marks the left-hand side of the entrance to the anchorage.

**Leche Juston Bank Buoy** is moored in  $2\frac{1}{2}$  fathoms (4.6 m.) 2,400 yards southward of Point Sable. This buoy marks the right-hand side of the entrance to Cohe du Lamentin.

**Buoy.**—A small red buoy marks the northwest spit of the Leche Juston Bank. Its approximate position is 1,350 yards,  $161^{\circ}$  from Sable Point.

**Caille Carcasse** is a shoal with  $1\frac{3}{4}$  fathoms (3.2 m.) located in the middle of Cohe du Lamentin Anchorage.

**Buoys.**—A red and black striped buoy marks this shoal.

The  $3\frac{1}{2}$ -fathom (6.4 m.) shoal situated 550 yards southward of Caille Carcasse is marked by a small conical buoy painted red.

A red buoy is moored off the southwestern edge of Grande Savate Bank.

**Directions for Cohe du Lamentin.**—From a position in Flammands Roads, Bout Point should be brought to bear  $140^\circ$  and maintained in that position. This course will pass eastward of Mitar Bank and southwest of Grande Leche. When  $\frac{1}{2}$  mile from Bout Point, with right (northern) tangent of Ramiers Island bearing  $223^\circ$ , alter course to make good  $90^\circ$ , which will pass through Three Island Pass. When southward of Monsigny Bank Buoy alter course to make good  $27^\circ$ , which will lead toward the anchorage. When abreast of the northwest Leche Juston Spit Buoy course may be altered to pass Caille Carcasse Shoal, thence to anchorage.

This passage should not be attempted without a pilot.

**Trois Ilets Anchorage** ( $14^\circ 33' N.$ ,  $61^\circ 02' W.$ ; *H. O. Chart 1022*), under the shelter of Rose Point, is situated three-quarters of a mile southeast of Bout Point and between them is a shallow bay nearly the same distance in length. The anchorage has a depth of 6 to 8 fathoms (11.0 to 14.6 m.). The village of Trois Ilets is situated to the southwestward of the anchorage.

**Gros Ilet**, 700 yards long, is situated about 1 mile southeastward of Point Rose, and is connected to the shore nearly half a mile south of it by a shallow bank, forming the southeast side of Trois Ilets anchorage.

**Dangers.**—A shoal with 3 fathoms (5.5 m.) lies 450 yards northward of Point Rose.

**A buoy**, striped black and red, marked "F" is moored on the southern side of this shoal.

**Banc Boucher**, with depth of  $2\frac{1}{4}$  fathoms (4.1 m.), lies half a mile northeast of Bout Point.

**Buoy.**—It is marked by a conical buoy striped horizontally with red and black bands.

**Banc Foucambert**, with depth of  $2\frac{1}{4}$  fathoms (4.1 m.) is situated half a mile northward of Point Rose.

**Buoy.**—The above bank is marked by a spherical buoy striped horizontally with red and black bands.

**Caille a Vache.**—The southwest extremity of the large shallow bank extending  $1\frac{1}{2}$  miles from the eastern shore of Fort de France Bay is named Caille a Vache.

**Buoys.**—A black buoy is moored near the western edge of this bank.

A red conical buoy on the north side of a 2-fathom (3.7 m.) patch lies nearly 600 yards northwest of the same point.

The following buoys are moored in Trois Ilets Anchorage:

**A red buoy** lettered "A" is moored on the northwestern edge of the shoal extending to the northward of Gros Ilet.

**Four buoys**, striped red and black, are moored in Trois Ilets anchorage to mark the location of four shoal patches which have less than  $2\frac{3}{4}$  fathoms (5.0 m.) of water on them.

**Directions for Trois Ilets Anchorage.**—Proceed as for Cohe du Lamentin until between Monsigny Bank and Foucambert Bank Buoys, then alter course gradually to the southward, steadying to make good course  $147^\circ$ , which will pass clear of both Foucambert Bank and Caille a Vache Bank. When about 300 yards westward of the red buoy, northwestward of Gross Ilet, alter course to the southward to pass midway between the two eastwards red and black buoys nearest to Gros Ilet. Anchor in accordance with draft. This passage should not be attempted without a pilot.

**Salée River Anchorage** to the eastward of Gros Ilet is the mouth of the Salée River and affords anchorage in  $5\frac{1}{2}$  to  $6\frac{1}{2}$  fathoms (10.1 to 11.9 m.).

**Dangers.**—The following dangers and buoys will be found in the approaches to this anchorage:

**Buoys.**—A black conical buoy moored to the southward of Beef Bank.

A red conical buoy moored on the northeast extremity of the small shoal off Gros Ilet.

A red conical buoy moored at the southwest point of Caille Sabe Bank.

A black conical buoy is moored on the northeast point of Caille Sabe Bank.

A red conical buoy is moored at the northwest extremity of the bank off Petit Islet.

Two green conical buoys are moored to the northeast of Petit Islet to mark the location of a wreck.

**Directions for Salée River Anchorage.**—Proceed as for Trois Ilet anchorage until about 300 yards southwestward of Caille a Vache Buoy, when alter course to the eastward and make good  $102^\circ$ . This course will pass about 200 yards to the southward of Beef Bank Buoy and northward of Caille Sabe Bank. Anchor in a position with Petit Islet bearing  $150^\circ$  distant about 300 yards.

**Cape Solomon** ( $14^\circ 30' N.$ ,  $61^\circ 07' W.$ ; *H. O. Chart 1009*) is about  $4\frac{1}{4}$  miles southwestward of Bout Point. From Ramiers Islet southward the coast is bold and steep-to.

**Grande and Petite Anse d'Arlet and Petite Anse du Diamant.**—The two former are separated by a bold promontory called Point Bourgos. All three of these coves have sandy beaches and afford good temporary anchorage  $\frac{1}{4}$  mile offshore in from 7 to 10 fathoms (12.8 to 18.3 m.) of water. There are no hidden dangers and the shore is perfectly bold as far as the eastern side of the Diamond Hill.

**SOUTH COAST.**—Diamond Rock lies about 1 mile southeastward from Diamond Hill, which forms the southwestern point of Martinique, with a clear channel between, named Fours. The rock is very remarkable, nearly square in form, each side about 800 yards long, and rises almost perpendicularly to the height of 574 feet (175.9 m.) above the sea. It is inaccessible except at a small spot on the western side, where landing may be effected under favorable circumstances. The southern and western sides of the rock are steep-to, but to the northward a small bank of  $5\frac{1}{4}$  and 6 fathoms (9.6 to 11.0 m.) extends to the distance of  $\frac{1}{4}$  mile, and 200 yards to the eastward there is as little as 4 fathoms (7.3 m.) of water. At about 1,500 yards  $112^\circ$  from the rock there is also a small detached coral bank, with  $4\frac{1}{2}$  fathoms (8.2 m.) of water on it.

Diamond Hill rises abruptly from the shore to the height of 1,568 feet (474.8 m.) and may generally be seen at a great distance; it is bold and steep-to.

**Anchorage on southern side of Martinique.**—Eastward of Diamond Hill are the following anchorages for small vessels: Grande Anse du Diamant, Anse du Marigot, Anse du Ceron, and Anse des Trois Rivières. At the latter place a sugar factory has been established. Pilote River has also an anchorage off its mouth. In entering, pass eastward of Ste. Luce Cay, which is surrounded by reefs. In approaching the anchorage of Grande Anse du Diamant, Olbian Reef must be avoided, lying  $\frac{1}{2}$  mile from the shore on the eastern side of the bay and having 6 feet (1.8 m.) of water on it.

**Mooring buoy.**—A black mooring buoy is located at the mouth of the Pilote River in about 9.3 fathoms (17.1 m.) of water on a line joining Figuer and Dunquerke Points.

**CUL DE SAC MARIN** ( $14^\circ 28' N.$ ,  $60^\circ 53' W.$ , *H. O. Chart 1021*) is a small anchorage, with a most irregular coast line lying between Borgnesse Point and Marin Point. The anchorage space is very much limited because of the numerous shoals inside the harbor.

**Depths.**—While there is plenty of water for any draft vessel, the harbor is not recommended for any but moderate draft vessels.

**Dangers.**—**Crique Bank**, with a depth of 2 fathoms (3.7 m.), lies 450 yards southeastward of Borgnesse Point.

**Buoy.**—A red conical buoy is moored on the northern edge of this bank.

**Trois Cailles Bank**, with 0.5 fathom (0.9 m.), extends 1,200 yards in a southwesterly direction from Marin Point.

**Buoy.**—A red conical buoy is moored on the western edge of this bank.

**Singe Bank**, with 1 fathom (1.8 m.) lies in the middle of the fairway, 300 yards west of Marin Point.

**Buoy.**—A black buoy is moored on the southeastern extremity of this bank.

**Major Bank**, on the northern side of the harbor, has a depth of less than 1 fathom (1.8 m.).

**Beacon.**—There is a beacon with a black cylindrical top mark on the eastern edge of this bank.

**Milieu Bank**, with depth of less than 1 fathom (1.8 m.), lies in the northern part of the harbor.

**Beacon.**—There is a beacon with a red conical top mark on the western edge of the bank.

**Entrance range.**—Two beacons with white spherical tops are placed one on the extremity of Marin Point and the other on a hillock within Cayot Point. These beacons in range lead to the entrance of the pass but lead a little close to the 4-fathom (7.3 m.) bank westward of Crique Bank.

**Caution.**—The location of the buoys is not to be relied upon.

**Anchorage.**—The best anchorage will be found with Marin Point bearing  $223^{\circ}$  and the white beacon on Cayot Point bearing  $90^{\circ}$ . In this berth a vessel will have 12 fathoms (21.9 m.) of water and good holding ground. The anchorage nearer the town is fit only for coasters. At the head of the bay, near the village of Marin, a sugar factory has been established, the chimney of which is a conspicuous mark.

**Pilots.**—Pilots for Cul de Sac Marin should be obtained at Fort de France.

**Directions.**—Vessels coming from the southward or southeastward will first make the Vauclin Mountain, 1,657 feet (506.0 m.) in height, situated about 6 miles northward of the entrance to the port; being steered for bearing eastward of  $10^{\circ}$  will lead to the entrance westward of St. Anne Shoals.

The bank of soundings fronting the western shore northwestward of Cabrit Island is so steep that by day the eye will greatly assist the lead, discolored water being easily seen from aloft in a sailing vessel proceeding along shore.

When the white beacon on Cayot Point, bearing  $69^{\circ}$ , is open to the left of the beacon on Marin Point, make good  $69^{\circ}$  which will head for the first-named beacon and will pass to the northward of Crique Bank Buoy. With Trois Caille Bank red buoy about 200 yards on the starboard beam, alter course to pass to the southward of Singe Bank black buoy. When the extremity of Cayot Point is in range with Marin Point beacon, bearing  $62^{\circ}$ , the vessel will be to the southward of Singe Bank, and the course may be changed slowly to the left to pass about 150 yards northward of Marin Point. Thence the vessel may head for the anchorage.

Sailing vessels having passed Dunkerque Point, should approach Borgnesse, the western point of entrance to Cul de Sac Marin, carefully, to avoid the shoal ground off Ste. Anne, and anchor about  $\frac{1}{4}$  miles southwestward of Borgnesse Point, ready to warp or tow in as the breeze slackens toward the evening.

The entrance should not be attempted without a pilot.

**Bourg de Marin** ( $14^{\circ} 28' N.$ ,  $60^{\circ} 53' W.$ ; *H. O. Chart 1021*), situated at the head of Cul de Sac Marin, has a population of about 4,000. Fresh water can always be obtained, as can certain kinds of fresh provisions, but fresh meat can be obtained only three times a week. There is a civil hospital.

**South coast** (*H. O. Chart 1009*).—From Point Dunkerque the coast trends southeasterly for 2 miles, thence northeasterly to Baham Point. The coast is foul, as shallow reefs extends offshore about 1,500 yards.

**Saline Point**, the southern point of the island, is very low, and reefs extend off about 1,500 yards; about  $\frac{1}{2}$  mile to the southeastward of the point is the small islet of Cabrit.

**Cabrit Islet** is also low, and foul ground extends for  $\frac{1}{2}$  mile southwestward of the islet. The shore should not be approached in this neighborhood nearer than 1 mile.

**Directions for south coast.**—If bound to the westward, having passed Cabrit Islet, a  $286^{\circ}$  course for  $10\frac{1}{2}$  miles will lead to abreast Diamond Rock, then hug the shore close aboard and choose an anchorage as before directed. It is necessary, however, to observe that when under the lee of the highlands preparation must be made to meet the sudden and violent gusts which rush down the gorges of the mountains and which are the more dangerous as they come upon a vessel when she is probably becalmed and quite unmanageable. A vessel may pass between Diamond Rock and the coast, but no real advantage will be gained.

**EAST COAST.**—The eastern shore of Martinique, as far north as the peninsula of Caravelle, is bordered by coral banks and reefs which extend offshore to a distance of  $2\frac{1}{2}$  miles. There are several passages through these reefs leading to small harbors and anchorages inside.

**Vauclin Point** ( $14^{\circ} 34' N.$ ,  $60^{\circ} 50' W.$ ; *H. O. Chart 1009*) is the extremity of a fork of the great mountain of that name which separates the Cul de Sac Vauclin from those of Grenade and Sans Souci to the northward of it. The ridge slopes uniformly but rapidly, terminating at a small steep hill on the shore 216 feet (65.8 m.) above the sea. The main bank and outer reefs really commence at this point and extend northward from Cabrit Island to Vauclin Point, the coast is skirted by the inner reef, which extends offshore  $\frac{1}{2}$

mile at the southern point and gradually increases to  $1\frac{1}{2}$  miles off-shore at the northern point.

**Vauclin Channel** is only available for small coasters. To enter from the southward bring the little hill on Vauclin Point to bear  $326^\circ$ , which course will lead through between the reefs, which are only 200 yards apart toward the inner end of the channel. The depth varies from 7 to 8 fathoms (12.8 to 14.6 m.).

**Buoys.**—Two red conical buoys mark the east side of Vauclin Channel; the southernmost buoy has a conical top mark.

A red conical buoy, with red and black horizontal stripes, is moored northward of Loup Baudin Shoal.

**Brigot Channel**, about  $1\frac{1}{2}$  miles northward of Vauclin Channel, is narrow and too dangerous for any vessel to attempt without the assistance of a pilot.

**Pinsonelle Channel** is  $2\frac{1}{2}$  miles to the northward of Brigot Channel, between the Sans Souci Cays and Pinsonelle Cay. To run through bring Mount Vauclin on a  $240^\circ$  bearing, upon which line there will not be a less depth than  $4\frac{1}{4}$  fathoms (7.8 m.).

**Culs de Sac Vauclin, Sans Souci, Simon, and Fregate** are small inlets, in which vessels of light draft will find good anchorage, but they are all equally difficult to navigate without the assistance of a pilot.

Sugar factories have been established at Simon, Francois, Galion, and Ste. Marie. All these ports can be reached without much difficulty, but they are difficult to get away from, owing to the strong northeast wind blowing directly onto this coast, and the heavy sea.

**Mitan Channel** lies nearly midway between Thiery Isle and Mitau Cay  $2\frac{1}{4}$  miles north of it. The latter is a small, low cay on the inner edge of the reef. It lies east  $2\frac{1}{4}$  miles from Rose Point; about a mile northward of it is the Loup Garou, a similar small cay.

Thiery Isle is the easternmost of a group of small islets lying about  $1\frac{1}{2}$  miles from the nearest shore. It is about 100 feet (30.5 m.) high, and its summit has the appearance of a rounded cap covered with brushwood.

If proceeding to any of the anchorages inside the reef via Mitau Channel, bring Brunet Point ahead bearing  $320^\circ$  and stand in making this course good. It will lead about 400 yards westward of Mitau Cay. When eastward of Chardons Islet, course may be altered in the direction of the anchorage desired, being careful to avoid Loup Marseilles, which has a least depth of 10 feet (3.0 m.).

**Francois Anchorage**,  $2\frac{1}{4}$  miles southward of Rose Point, is a bay about 1,500 yards deep, with excellent holding ground, completely sheltered from all winds by the land and dry reefs; through the latter there are two narrow, intricate channels, which are so ex-

tremely difficult to navigate that none but steamers or small vessels can get out of them. Sugar factories are established at the towns of Francois and Aubin.

**Buoys and beacons.**—The pass to the anchorage at Francois is buoyed with two black conical buoys on its eastern side and a red conical buoy on its western side. A black and red conical buoy in horizontal bands is moored on the northern side of the inside shoal.

Farther in, near the anchorage, two shoals are marked by beacons, the eastern one black and the western red.

**Caracoli Channel**, between Point Caracoli and the detached reef, with  $5\frac{1}{2}$  fathoms (10.1 m.), upon which the sea breaks with great violence during strong winds. It is the best of the several channels between the reefs.

In entering, the shore should be favored until past Point Caracoli, when a vessel should keep between  $\frac{1}{2}$  and  $\frac{3}{4}$  of a mile offshore until course can be shaped for anchorage.

**Robert Harbor** ( $14^{\circ} 40' N.$ ,  $60^{\circ} 55' W.$ , *H. O. Chart 1009*) at its entrance between Chardons Islet and Grotte Rock, is not more than about 900 yards in breadth, but becomes much wider within. The southern side of the channel is bounded by reefs nearly dry, which extend off in every direction from Rose Point and from which rise the two small islets named Rose and Chardons. The edge of the reef is nearly 200 yards from the latter and is steep-to. Grotte Rock, on the northern side, is steep-to and is connected by a bank of coral and gravel (barely covered by the sea) to a small islet of the same name, which is also united in a similar manner to Ramville Islet at the southern point of Galion Bay.

**Buoys and beacons.**—A black conical buoy is moored on the northern edge of La Guillotine Bank. A conical buoy with red and black horizontal bands is situated about 1 mile westward of Point Royale.

Two red conical buoys with conical top marks mark the northern side of the harbor.

The channel to the anchorage off the town is marked on the northeast side by two red beacons and on the southwest side by two black beacons.

**Anchorage.**—About  $1\frac{3}{4}$  miles to the westward of Grotte Rock is the islet of Little Martinique, to the westward of which is the best anchorage for large vessels. Here smooth water and good holding ground will be found, with from 5 to 6 fathoms (9.1 to 11.0 m.) of water. Abreast of the town from 13 to 16 feet (4.0 to 4.9 m.) of water will be found.

**Directions.**—Having entered within the main bank by Caracoli Channel, there is no difficulty in making or entering Robert Harbor,



for the reefs are nearly dry and readily distinguished by the discolored water.

**Robert**, the town ( $14^{\circ} 41' N.$ ,  $60^{\circ} 57' W.$ ), lies on the northwestern shore of the bay. It contains about 6,000 inhabitants, and limited quantities of provisions may be obtained.

**Galion Bay**, on the southern side of the peninsula of Caravelle, is 4 miles wide at the entrance between Ramville Islet, which is about 328 feet (100.0 m.) high with a bushy rounded summit, and Point Caracoli, but the bay becomes contracted toward its inner end, and between Point Banane and Brunet Point it is not more than a mile in breadth. The western shore is much indented and forms several bays, which, however, are skirted and obstructed by numerous coral shoals and a heavy swell sets in. The Galion River, with a sugar factory about  $\frac{1}{2}$  mile within its mouth, empties into the bay to the southwestward of a remarkable conical wooded islet of the same name. The only safe anchorage against all winds is on the northern side of the bay, under the western side of Brunet Point, which lies  $2\frac{1}{2}$  miles to the southwestward of Point Caracoli and is steep-to and bold. Within Point Caracoli is the Cul de Sac de la Tartane, but it is choked with reefs and of no importance.

**Dangers.**—**Loup Banane and Loup Charpentier**, two shoals with 9 feet (2.7 m.) and 13 feet (4.0 m.) of water, respectively, over them, lie half a mile northeast and east of Point Banane.

**Buoy.**—A black conical buoy, with a cylindrical top mark, marks the eastern extremity of Loup Banane.

**Directions.**—Having entered the Caracoli Channel, in running down the southern side of the peninsula of Caravelle, the shore should not be approached within  $\frac{1}{2}$  mile until Brunet Point bears  $325^{\circ}$ , then haul in and anchor as convenient, about  $\frac{1}{4}$  mile from the eastern shore, with the point bearing  $123^{\circ}$ , and a large house north of it  $22^{\circ}$ , in  $4\frac{1}{2}$  fathoms (8.2 m.) of water.

**Directions—Leaving Robert Anchorage or Galion Bay.**—With the wind at northeast, or even east-northeast, and moderate weather, vessels bound out from either Galion Bay or Robert Harbor will find Mitau Channel preferable to Caracoli. In general, the sea is much smoother to the southward of Mitau than at any other part of the reef. Leaving Galion Bay care must be taken to avoid Loups Banane, Charpentier, and Marseillais, the latter of which is a narrow ledge, with 10 feet (3.0 m.) of water on it, lying about  $\frac{1}{2}$  mile  $271^{\circ}$  from Loup Garou, and generally breaks. Leaving Robert Harbor, the semaphore on Tartane Hill open to Ramville Islet leads eastward of the reefs which extend off Chardons Isle and Rose Point, and having brought Mitau Cay to bear  $11^{\circ}$  about a mile, haul to the wind through the channel. The semaphore of Tartane Hill in

range with Mitau Cay leads just outside and to windward of the reefs on the southeastern side of the island.

**Caravelle Peninsula**, of which Point Caracoli is the southeastern extremity, is of very irregular breadth, varying from  $\frac{1}{2}$  to 2 miles. The narrow isthmus which connects the peninsula with the mainland is only  $\frac{1}{2}$  mile wide and separates the two bays of Trinite and Galion. Farther to the eastward the land is higher, gradually rising to the summit of Tartane Hill, 623 feet (189.9 m.) high, where a semaphore is erected.

**Caravelle Rock**,  $1\frac{3}{4}$  miles northward of the peninsula, 95 feet (29.0 m.) high, is an excellent landmark for vessels approaching this part of the island. It is steep-to, quite barren, and its peaked summit has been completely whitened by birds. From a distance it looks like a vessel under sail. The channel between Caravelle Peninsula and this rock is deep and free from danger.

**Caravelle Peninsula Light**, fixed white, 410 feet (125.0 m.) above high water, visible 15 miles, is exhibited from a gray tower 25 feet (7.6 m.) high on the summit of Cracoli Hill, at the extremity of Caravelle Peninsula and 700 yards inland.

**TRINITE BAY** ( $14^{\circ} 46' N.$ ,  $60^{\circ} 58' W.$  *H. O. Chart 1064*) is inclosed between Sugarloaf Rock and Point du Diable. It is fronted by several dangerous reefs, but affords a safe anchorage in ordinary winds.

**Depths.**—The bay has depths of 15 fathoms (27.4 m.), decreasing to  $5\frac{1}{2}$  fathoms (10.1 m.) off the town. There are numerous dangerous shoals in the bay.

**Landmarks.**—**St. Aubin Isle** is an excellent landmark in approaching Trinite Bay. This isle is high and steep, with a round, bushy summit. Its northern side is steep-to and clear of danger, but to the east-southeastward it is foul for  $\frac{1}{4}$  mile, and its southern side is joined to the shore by a coral reef nearly dry in places.

On the high ground on the isthmus connecting Caravelle Peninsula to the mainland is the village of Beau Sejour with a prominent windmill which serves as an excellent landmark.

In addition to Beau Sejour Mill there are two prominent landmarks. One is the chimney of a distillery, 89 feet (27.1 m.) high, standing to the southward of the town; the other is a little chapel, eastward of the city, which looks like a watchtower, rectangular in form and painted white.

**Dangers.**—**Loup Ministre** has 6 to 9 feet (1.8 to 2 m.) of water on it, and as the sea usually breaks heavily it forms a useful guide to the entrance of the bay.

Between this reef and Caravelle Peninsula there are many other reefs, which make the passage to the eastward of the reef dangerous.

**Mitan Bank** is small, carries a depth of only 11 feet (3.4 m.), and does not always break. It bears  $32^{\circ}$  from the fort, and lies on a line between the fort and Loup Ministre.

**Buoy.**—A spherico-conical buoy, painted in red and black horizontal bands and surmounted by a spherical topmark, marks the western extremity of Mitan Bank.

**Loup de Ste. Marie.**—The western end of the bank on which the Loup Ministre lies terminates about  $1\frac{1}{2}$  miles northward of St. Aubin Isle, but rather less than 1 mile farther,  $292^{\circ}$ , is the Loup de Ste. Marie, with  $5\frac{1}{4}$  fathoms (9.6 m.) of water on it. With strong northeast winds the sea breaks heavily.

**Channel.**—There is a clear channel between this shoal and the western end of Loup Ministre, as well as between it and Ste. Marie Islet, in front of the village of the same name and joined to the mainland by a sandy bank.

**Buoys.**—Two red conical buoys mark the two shoal patches that are situated on the western side of the harbor. Two black conical buoys mark the edge of the shoal water on the eastern side of the harbor.

**Anchorage.**—Good outer anchorage will be found in 9 fathoms (16.5 m.) with Fort Point bearing  $210^{\circ}$  and the mill of Beau Sejour  $123^{\circ}$ .

**Pilots** for this bay and adjacent anchorages are generally to be found in the offing.

**Directions.**—The best approach to the anchorage is to pass on either side of Loup de Ste. Marie.

In approaching from the eastward do not bring Caravelle Rock to bear northward of  $88^{\circ}$  until Beau Sejour Mill bearing  $152^{\circ}$  is open to the eastward of St. Aubin Island. Then steer for the mill, maintaining it on this bearing until Ste. Marie Island bears  $265^{\circ}$ , when course should be altered to the eastward to make good  $139^{\circ}$ . This course should head for the red and black buoy on Mitan Bank. When the chimney to southward of the town is open to the eastward of Fort Point, bearing  $188^{\circ}$ , course should be altered to make good  $183^{\circ}$ , which will head for the anchorage.

**TRINITE** ( $14^{\circ} 44' N.$ ,  $60^{\circ} 58' W.$ , *H. O. Chart 1064*), situated on the western shore of the bay, is the second most important port in Martinique and in 1925 had a population of 6,250.

**Supplies.**—Fresh commissary provisions are plentiful and can be secured at anytime. The town water is bad, but good water can be obtained at the Beauré Estate.

**Ste. Marie Islet** ( $14^{\circ} 47' N.$ ,  $61^{\circ} 00' W.$ , *H. O. Chart 1009*), in front of the village of the same name, is connected to the shore by a narrow sand bank. A reef is reported to skirt the shore southward of the islet and to extend from the islet two-thirds of the distance across the bay.

**Ste. Marie Anchorage.**—Immediately to the westward of Ste. Marie Islet is the mouth of the river of the same name. A sugar factory has been established near the mouth of the river, but the anchorage off it is very much exposed and is unsafe, the locality being marked by the chimneys. Vessels lie in from 5 to 8 fathoms (9.1 to 14.6 m.) of water about  $\frac{1}{2}$  mile offshore.

**Northeast coast.**—From Sugarload Rock to Macouba Point, the northern point of the island, the coast is bold, steep-to, and affords no anchorage. It consists of small sandy bays, separated from each other by bold, rocky bluffs, and is exposed to the full force of the wind and sea.

## CHAPTER V

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### THE WINDWARD ISLANDS—ST. LUCIA TO BARBADOS, INCLUSIVE

**ST. LUCIA ISLAND** ( $13^{\circ} 50' N.$ ,  $61^{\circ} 00' W.$ , *H. O. Chart 1261*) was first settled by the French in 1635, and after numerous changes came into the possession of the English in 1803 and has ever since remained in their hands. The traces of French occupation are still apparent, a large portion of the population speaking that language. The government is conducted by an administrator, aided by an executive and a legislative council, who is subordinate to the governor of the Windward Islands, located at St. George's Grenada.

**General description.**—The island is  $23\frac{1}{2}$  miles long, north and south, by 12 miles in breadth, and has an area of 233 square miles. It is mountainous and broken up by gorges, watercourses, and ravines, and for the most part is covered with forest and tropical vegetation. Piton Morne Gimie, the highest peak in the island, is 3,145 feet (958.5 m.) above the sea; Gros and Petit Pitons, of 2,619 and 2,461 feet (798.2 and 750.3 m.), respectively, occupy isolated positions on the southwestern part of the island, are two remarkable conical rocky peaks, rising almost perpendicularly out of the sea, and form prominent marks when approaching from seaward. La Sorciere, 2,221 feet (676.9 m.) high, when seen from the northeastward, appears as a perfect cone, but from the southeastward as a round-backed mountain; these mountains are seldom entirely free from clouds.

**Anchorage.**—The east coast is bold and steep-to and, due to being the windward side of the island, is exposed to the full sweep of the wind and sea and has no safe anchorages. There are several fine bays on the western side which afford excellent anchorage in all types of weather.

**The climate** in the valleys and lower parts of the island is hot and unhealthy; on the elevated parts cool but very damp. The temperature during the summer months at Port Castries varies between  $88\frac{1}{2}^{\circ}$  and  $70^{\circ}$  F., and in winter between  $85^{\circ}$  and  $65^{\circ}$  F. The easterly trade wind blows more or less throughout the year, but is always squally. Rain falls at times all the year round, but it is much heavier from June to October than at other times. Annual rainfall

at Port Castries averages 98 inches. (See Meteorological Tables; Appendix IV.)

**Current.**—Within 5 miles of the coast of St. Lucia the current generally sets to the north and the northwest with a velocity up to  $2\frac{1}{2}$  knots. The current divides off Brandou Point, Cape Moule à Chique, one part running northwestward along the south coast, the other northward along the east coast; the streams would seem to meet again somewhere off the north end of the island, according to their varying rates, for, generally speaking, there is a small area off that end of St. Lucia Island which has less, or is free from, current. The appearance or absence of rips, and their unstable positions, would seem to indicate also that the parting and meeting of the two portions of the current varies according to their rates. When the current is weak, it is probable that the influence of the ebb or south-going tidal stream is felt.

**The population** of St. Lucia in 1926 was 55,698.

**EAST COAST**—**Pointe du Cap** ( $14^{\circ} 07' N.$ ,  $60^{\circ} 57' W.$ , *H. O. Chart 1261*), the northern extremity of the island, is bold, but comparatively low, consisting of several small peaks, partially wooded, from 429 to 525 feet (130.8 to 160.0 m.) high. It is free from dangers, and the 20-fathom (36.6 m.) curve is about  $2\frac{1}{2}$  miles offshore.

When beating around this point it is recommended to hug the shore, and so avoid the current.

**Hardie Point**, the northeastern point of the island, is sloping and well defined. There is a dangerous rock  $\frac{1}{4}$  mile east of it named Gros Loup, which generally breaks.

Between Hardie Point and Esperance Harbor the bottom for nearly  $\frac{1}{2}$  mile offshore is foul and uneven and should be given a wide berth. In fine weather, however, landing at Fayolle may be effected through the boat channels.

**Esperance Harbor** is a narrow creek. It affords neither protection nor room for vessels other than the native boats frequenting it for shipping logwood.

From Esperance Harbor to Cape Marquis the shore is rocky, bold, and steep-to, with moderately high peaked hills in the rear of it.

**Cape Marquis** is an abrupt rocky point 75 feet (22.9 m.) high, at the extremity of a steep slope from a conspicuous peaked hill named Gaiac. Immediately south of this cape, in Petit Trou, there is a landing in ordinary weather. From here the coast trends to the southward and south-southwestward.

**The coast** from Anse Marquis to Port d'Ennery is for the most part bold. Landing may be effected under favorable circumstances at Port Dauphin and Anse Marquis. The summit of Tanti Point is

a conspicuous cone, 424 feet (129.2 m.) high. There is a rock awash 400 yards off Tortue Point.

At Trou Halhal there is a good landing in ordinary weather.

**Bouche Island**, at its entrance, is a conspicuous mushroom-shaped rock 50 feet (15.2 m.) high. Mamelles Point consists of a series of high cones terminating in a sandstone cliff 722 feet (220.1 m.) above the sea. There is a rock 98 feet (29.9 m.) high off it, and another 139 feet (42.4 m.) high to the southward of it.

**In Fond d'Orr Bay** small sloops anchor occasionally to ship sugar, but it is unsafe, and a swell rolls in on the beach.

**Port d'Ennery** ( $13^{\circ} 55' N.$ ,  $60^{\circ} 54' W.$ , *H. O. Chart 1261*) is the only place on the weather coast that may be called an anchorage; a slight protection is afforded by the island and peculiar shaped rocks at its entrance, inside which the anchor may be dropped as convenient. It is used occasionally during crop time by the smaller class of sailing vessels, and sometimes steamers anchor there for an hour or so, but in case of the former, before sailing in, arrangements must be made at Port Castries for being towed out, as it is not possible to beat out without great risk. The hospital is conspicuous from seaward.

**Port Praslin** is 2 miles south of Port d'Ennery and is small and shallow. The port is now almost deserted.

**Chapeau Point** is a remarkable double point, on which a red patch shows in the morning sun. In Anse Mabouya there is a tramway leading to the Fon Devaux estate, from which small droghers occasionally ship sugar and logwood.

**Port Micoud** may be described as a good boat harbor. None but the smallest sloops venture in, and the passage, which is on the southern side of the entrance reef, is very narrow. The village is small and poor.

**Vierge Point** is low, flat, and prominent.

**Port Savannes** is sometimes used by small sloops, and sugar is shipped there from the estates in the vicinity; its access is difficult and the ground very foul to the southward; there is, however, a boat channel inside the reef fronting this shore. The Savannes estate, with its chimneys, shows up well in the morning sun, with Morne Victorin immediately behind it.

**Maria Island** is located 1 mile about  $25^{\circ}$  from the southern point of the main island. It is 329 feet (100.3 m.) high.

**SOUTH COAST**—**Cape Moule a Chique**, the southern extremity of the island, is a fine, bold, and precipitous headland, with a double summit of nearly equal height on the eastern point. At a long distance it appears as an island, on account of the low land immediately north of it. It may be passed close-to, but 1 mile southward of

it is a coral shoal named Fond Blanc, with 6 fathoms (11.0 m.) on it, which it is advisable to keep clear of.

The 20-fathom (36.6 m.) curve is about 4 miles off the cape.

**Brandou Point Light**, flashing white, 745 feet (227.1 m.) above high water, visible 35 miles, is exhibited from a masonry tower 29 feet (8.8 m.) high on Brandou Point, the southeastern part of Cape Moule a Chique Peninsula. (See Light List.)

**Vieux Fort Bay** ( $13^{\circ} 44' N.$ ,  $60^{\circ} 58' W.$ , *H. O. Chart 1154*).—This bay has excellent anchorage in from 5 to 8 fathoms (9.1 to 16.5 m.), the protection being afforded by the Moule a Chique Peninsula. The mouth of the bay from Mathurin Point to Georgie Point is  $1\frac{1}{4}$  miles across.

**Shoals**.—There is a coral bank extending 1,400 yards south-westward of the town, having two shoal heads, Caille Reef, awash, and a 3-fathom (5.5 m.) patch at the outer extremity.

**Directions**.—The range Cross Hill, 111 feet (33.8 m.) high (just east of the pier), in range with Morne Bellevue, 350 feet (106.7 m.) high, bearing  $30^{\circ}$ , will lead in, clear of all danger. Anchor in accordance with draft with good holding ground.

Sailing vessels are obliged to beat up to the anchorage and the wind is somewhat baffling. The bank can best be avoided by cross bearings and the use of the lead.

**VIEUX FORT** ( $14^{\circ} 48' N.$ ,  $60^{\circ} 58' W.$ ; *H. O. Chart 1154*) is a poor one, and not considered healthful, in consequence of the trade wind blowing over the swamp and marsh at the back of the town. There are two small piers with depths of about 3 feet (0.9 m.) alongside.

Water can be obtained here, but it is not particularly good; also fish, fruits, vegetables, and fresh meat.

**Laborie** (*H. O. Chart 1261*) is a small village northwestward from Vieux Fort, and is connected with it by a good road. The anchorage is confined, the entrance is narrow, and a swell often sets into it. A small steamer calls regularly from Port Castries. There is a small landing pier here.

**The Laborie Reefs** break heavily, except in calm weather. From here to Doree River the ground is foul for nearly  $\frac{1}{2}$  mile offshore.

**Balembouche Rocks**.—These rocks lie about 2 miles westward of Laborie and 400 yards from the shore, but the shoal water off them extends to the southward for nearly  $\frac{1}{2}$  mile. They break as a rule when there is any swell. There is a passage for boats inside.

The depths off this shore are reasonably regular and the lead will be a good guide when standing in.

When approaching the southern coast from the westward, keep Maria Islet well open to the southward of the point immediately westward Anse Noir.

**Doree River Anchorage**.—At a short distance westward of Balembouche is the Doree River, off which there is anchorage in 5



or 6 fathoms (9.1 to 11.0 m.) of water. There is not suitable landing place.

**Choiseul.**—One and one-quarter miles northwestward of Doree River is anchorage in 7 fathoms (12.8 m.) off the village of Choiseul and abreast the church.

There is a small wooden pier at Choiseul, and a small steamer from Fort Castries calls regularly.

**Beaumont Point**,  $2\frac{1}{2}$  miles northwestward from Choiseul, is the southwestern extremity of St. Lucia. The point is situated directly under Gros Piton.

**WEST COAST.**—From Beaumont Point the land trends to the north and north-northeast. The two Pitons, or Sugarloaves, are so unmistakable that they need no description. The water off them is very deep, and the squalls come down occasionally with great violence.

**Soufriere** ( $13^{\circ} 51' N.$ ,  $61^{\circ} 04' W.$ , *H. O. Chart 1261*).—This is a picturesque town, clean and orderly, and although hot, it is said to be very healthful. The smell of the sulphur springs impregnates the air for miles around and may be noticed some distance out to sea. The sulphur springs are about 2 miles outside the town. The population is about 3,000.

Soufriere possesses no anchorage; small vessels can drop their anchor in 20 fathoms (36.6 m.) about 150 yards from the beach, haul their sterns in to the shore, and secure to the trees. There is a small landing pier.

A sailing vessel entering Soufriere Bay should guard against the squalls which blow with great force down the valleys.

**La Vielle Point**, nearly midway between Soufriere and Grand Cul de Sac Bays, may be recognized by a white-painted wood cross, about 15 feet (4.6 m.) high, erected on the point. It shows up well against the trees.

**L'Anse la Raye**, with the village of same name at its head, lies eastward of the point. Rocks extend off its northern point, within which is a depth of 14 fathoms (25.6 m.).

**Roseau Bay** is about 8 miles to the northward of Soufriere. It is of the same character as Soufriere Bay, namely, deep water close to the beach. At Roseau vessels anchor during crop time, about 400 yards from the shore, and ship sugar from the Roseau factory, a tramway and pier being constructed for that purpose.

The coast is all along bold, and in places rises vertically from the sea.

**Marigot Harbor** ( $13^{\circ} 58' N.$ ,  $61^{\circ} 02' W.$ , *H. O. Chart 1166*) is a remarkable little creek about  $\frac{1}{2}$  mile in length, leading into a basin. The channel between its fringing reefs is about 100 yards wide, and

shoals gradually from 11 fathoms (20.1 m.) at the entrance to 3½ fathoms (6.4 m.) in the basin. It is a well-protected anchorage, but is seldom frequented.

**Grand Cul de Sac Bay**, 2 miles south of Port Castries, is an open bay, ½ mile broad, and affords good anchorage to all sized vessels. Its northern shores are precipitous and steep-to. The southern shore line consists of rock and sand, which, except off the telegraph hut, is fronted by a coral shoal extending 200 yards from the shore.

The Grand Cul de Sac River empties into the head of the bay, where its deposits have formed a sandy beach and shoal water for a distance of 400 yards. An extensive sugar factory is situated on the southern side of the river mouth, where a pier runs out to a depth of 9 feet (2.7 m.).

**Directions.**—When entering from the northward, Ciceron Point can be passed close-to; but from the south, Bananes Point must be given a good berth on account of the rocks extending 200 yards north of it. The pierhead in range with the factory chimney, and Seine Point telegraph hut bearing 188°, is a good position for most vessels to anchor, in 13 fathoms (23.8 m.), mud. The submarine cable lands at the telegraph hut in this bay.

**Toque Bay Landing** (*H. O. Chart 1165*).—The landing in Toque Bay is usually difficult, even on the calmest days, as a swell outside nearly always causes considerable surf.

**PORT CASTRIES** (14° 01' N., 61° 00' W., *H. O. Chart 1165*).—Port Castries, one of the most secure harbors in the West Indies, lies on the western side of St. Lucia, about 7 miles from the northern end of the island. It is 1 mile in length in a 110°–290° direction, averaging ¼ mile in width.

Port Castries is the only port of entry in St. Lucia Island, and as such, trading vessels bound to other ports of the island must stop here as the first port of call.

**Depths.**—The harbor and approaches have depth of 9 fathoms (16.5 m.) on the range marks, 7 to 9 fathoms (12.8 to 16.5 m.) in the other parts of the anchorage, and 4 to 5 fathoms (7.3 to 9.1 m.) in the inner port, available at all times for all classes of vessels.

**Aspect.**—**Morne Fortune.**—Above the town of Castries, on the southern side, rises the Morne Fortune, 845 feet (257.6 m.) high, on which stands Fort Charlotte and the military quarters. These buildings are conspicuous from seaward. (See view 31, Appendix V.)

**Vigie** is the name given to the promontory which forms the northern shore of the harbor. It is low about its junction with the mainland, gradually rising to a wedgelike summit 295 feet (89.9 m.) high at its extremity.

**Signal station.**—There is a Lloyd's and also a harbor signal station near Vigie Lighthouse at the entrance.

**Port Castris Light**, group flashing white, 320 feet (97.5 m.) above high water, visible 24 miles, is exhibited from a round masonry tower with red roof 36 feet (11.0 m.) high on the summit of Vigie. (See Light List.)

**Tapion Rock**, on the southern side of the entrance, is a semi-detached rock, 80 feet (24.4 m.) high, reddish in color, but not easily distinguished from the northward.

**Tapion Rock Light**, occulting white, 50 feet (15.2 m.) above high water, visible 5 miles, is exhibited from the old battery 7 feet (2.1 m.) high on Tapion Rock. (See Light List.)

**Shoals.**—Tapion Shoal, on the southern side of the entrance, extends 200 yards westward of Tapion Rock, with only about 3 feet (.9 m.) of water at 80 yards off the rock.

**Coconut Shoal**, about  $\frac{1}{2}$  mile within the entrance, extends about 200 yards offshore, with a depth of 9 feet (2.7 m.) on its outer edge.

**Beacon.**—A beacon consisting of three poles surmounted by a red triangle stands in 11 feet (3.4 m.) of water at the northeastern edge of Coconut Shoal. When necessary, for ships, either entering or leaving the port after dark, a fixed green light will be exhibited from this beacon.

**Shoals.**—On the northern side of the entrance a shoal extends 150 yards off the point westward of the barracks.

At  $\frac{1}{4}$  mile westward of this point is a bank with 29 to 30 feet (8.8 to 9.1 m.) of water about 200 yards northward of the fairway.

Off St. Victor Point rocks and foul ground extend about 200 yards westward.

**Vielle Ville Shoal** extends about 300 yards from the shore and has 7 to 15 feet (2.1 to 4.6 m.) of water. Foul ground extends to lesser distances off all the points of the harbor, as charted. The shoal in the middle of the harbor has a dredged depth of 30 feet (9.1 m.). The Rendezvous Buoy lies close eastward of it.

**Beacons.**—A beaton, consisting of three poles surmounted by a three-sided black and white checkered shape, stands in 18 feet (5.5 m.) of water near the southwestern edge of Veille Ville Shoal.

A post stands in 10 feet (3.0 m.) of water near the southern edge, and a similar post in 10 feet (3.0 m.) of water near the eastern edge of the shoal as charted. When necessary for ships, either entering or leaving the harbor after dark, a fixed red light is shown from the Vielle Ville Beacon.

**Range lights.**—Front light, fixed red, 43 feet (13.1 m.) above high water, visible 5 miles, is exhibited from a white openwork iron structure with a white triangular day mark on West Wharf.

Rear light, fixed red, 110 feet (33.5 m.) above high water, visible 5 miles, is exhibited from a red iron framework structure 72 feet (21.9 m.), with a white triangular daymark, eastward of the town.

These lights in range  $120^{\circ}$  lead through the fairway to the town. When the sun is behind these structures the rear one is difficult to distinguish. At other times they are conspicuous.

**Anchorage.**—Due to the fact that the fairways to the wharves must be kept open, any vessel more than 300 feet in length and drawing more than 25 feet (7.6 m.) must moor bow and stern, and without the aid of a tub this is difficult in such crowded quarters. A recommended anchorage for naval vessels is outside the harbor in 15 fathoms (27.4 m.) with Vigie Light bearing  $135^{\circ}$ , distant 1,350 yards. This anchorage was found to be well protected from the prevailing winds and very much cooler than any berth inside the harbor.

The usual anchorage for naval vessels is at single anchor east of Rendezvous Buoy with stern secured to the buoy. The mooring buoy is said to be moored with a 3-ton anchor. The holding ground is very good. The wind in the winter months always blows down the harbor, varying between east-northeast and east-southeast, force 3 to 4. During the day it is very squally; at night the wind nearly always falls light and is more often than not quite calm.

**Mooring and warping buoys.**—A black mooring buoy with a single anchor, in 49 feet (14.9 m.) of water, known as Rendezvous Buoy, is placed on the eastern side of the 30-foot (9.1 m.) bank in the center of the anchorage. Three black spherical warping buoys are moored 450 feet apart, in about the center of the fairway of the harbor, about 450 feet northward of and parallel to the North (coaling) Wharf; they are not allowed to be used for mooring purposes.

**Quarantine anchorage.**—The bay on the northern side of the entrance to Port Castries is the quarantine ground. It is marked by a yellow buoy.

At the mouth of the harbor the vessel will be met by the harbor master, who, when a clean bill of health is presented, will give pratique, without which no vessel is allowed within 300 yards of the wharf.

**Tides.**—It is high water, full and change, at Port Castries at 2h. 36m. Springs rise about 2 feet (0.6 m.).

**Pilotage.**—Pilotage is neither compulsory or urgently necessary. Pilot vessel is a rowboat flying a red and yellow flag by day and showing a flare by night.

The signal for a pilot is a red and yellow flag.

Pilots meet incoming vessels off the harbor entrance.

**Tugs.**—Small coasting vessels, if in the harbor, serve as tugs.

**Directions.**—There is no difficulty in the way of a steamer of heavy draft entering by day.

From the southward, Tapion Shoal will be avoided by keeping Vigie Point bearing eastward of  $43^{\circ}$ , with Labrellotte Point well open of it, until the range comes on ( $120^{\circ}$ ), when the town of Castries will be open.

From the northward, give Vigie Point a berth of about 300 yards, which will lead 200 yards outside the sunken wreck off it; keep it bearing eastward of  $43^{\circ}$  and Tapion Rock eastward of  $155^{\circ}$  until coming on the fairway range; this will lead westward of the 29-foot (8.8 m.) bank in the entrance; then steer up the harbor with the two range structures in range, bearing  $120^{\circ}$ , which leads in the fairway between Coconut and Vielle Ville Shoals, until abreast Rendezvous Buoy, where anchorage may be taken or the vessel berthed at the coaling wharf if under 27 feet (8.2 m.) draft.

Shallow, rocky flats extend off most of the points, but the water is so clear that with the sun unclouded they are readily seen.

**Sailing vessels** bound to Port Castries from Barbados should pass round the northern end of the island, and, in shaping course, should make a large allowance for a lee or westerly current which generally prevails; this route will avoid the squalls and baffling winds on the western side of the island. Vigie Point should be given a wide berth in order to avoid the wreck about 100 yards off it, and on account of the baffling winds off the bluff, small sailing vessels in working up must be guided by the lead and estimated distance from shore or shoal; the wind is often baffling, but sometimes permits such vessels to lay right into the anchorage.

**At night.**—Approaching from the southward, Vigie Light, bearing eastward of  $55^{\circ}$ , leads westward of the Tapion Shoal, and from the northward, Tapion Light, bearing eastward of  $155^{\circ}$ , leads westward of the 29-foot (8.8 m.) bank north of the fairway. The red light at the town, bearing  $120^{\circ}$ , is the leading mark in.

**PORT CASTRIES** ( $14^{\circ} 01' N.$ ,  $61^{\circ} 00' W.$ , *H. O. Chart 1165*), at the head of the harbor, is the capital of the island and the seat of the government. The town is well laid out, but its streets are poorly paved; great improvement, however, has been effected in late years by the completion of the harbor and wharfage accommodation. The Victoria Hospital on Bananes Point is a fine building, the most imposing in the port.

The United States is represented by a consular agent.

In 1928 the population was 7,758.

**Wharves.**—A concrete coal wharf, known as the North Wharf, forms the northern side of the town; it has a length of 650 feet and a depth of 29 to 30 feet (8.8 to 9.1 m.) at low water alongside. West Wharf extends about 500 feet southward from the west extreme of North Wharf, and the depth alongside is about 18 feet (5.5 m.), this depth being maintained by dredging. As there is an inclination here to silt up, especially during the rainy season, inquiry should be made of the harbor master as to depth before proceeding alongside.

The harbor master's office and flagstaff are situated on the south jetty, where extension of wharfage is in progress. A training wall continued east-

ward of the North Wharf has reclaimed a considerable portion of land; it is known as North Wharf Extension and has 15 feet (4.6 m.) alongside.

There is a wharf at Vielle Ville Point, and another at Coconut Point.

Ships laden with oil are allowed to lie alongside the wharves only between 6 a. m. to 4 p. m.

There are no mechanical facilities for handling cargo, but stevedores are numerous.

**Repairs.**—There is no dry dock. Small repairs can be made at the government repair shop and at the sugar factory.

**Coal.**—There are normally about 20,000 tons of American coal kept in stock.

Ships coal alongside of the various wharves at any hour, day or night. With native labor, an average of 150 tons an hour can be put aboard. There are no coal hulks.

There are no lighters available for coaling.

**Water.**—Good water can be obtained from pipes laid onto the wharves, but there is no water tank to supply ships at anchor.

Port Castries is the best place in the West Indies for obtaining coal and water.

Supplies of all characters, both ship chandler and provisions, can be obtained at any time in large quantities. Engineer stores are not obtainable.

**Communications.**—Port Castries is a regular port of call for the steamship lines visiting the West Indies.

There is cable communication with St. Vincent, Grenada, Dominica, and St. Croix and thence with the remainder of the world.

A telegraph cable for military purposes has been laid down across the harbor. It leaves the southern shore about 300 yards, 110° from Tapion Rock Lighthouse, and lands on the Vigie side close under the large barracks marked on the chart.

There is a telephone line round the island connecting the several towns and villages with Port Castries.

**Radio.**—There is a radio station located here, and is open for commercial traffic. Call letters VQH. (See International List of Radio Stations.)

**Climate.**—The climate is tropical, with a mean noon temperature of 85.5° F., is healthy, and compares favorably with that of the other West Indian Islands. (See Meteorological Table, Appendix IV.) The sanitary conditions are very good.

**Hospital.**—The Victoria Hospital is open to seamen. Free treatment is allowed to seamen whose ship has paid full port charges.

**Quarantine regulations.**—The following quarantine regulations are in force: The master of every ship not admitted to free pratique shall exhibit on board his ship at the peak or other conspicuous place where it can be best seen, and at a height of not less than 20 feet above the hull of the ship, during the whole of the time between sunset and sunrise, a night signal consisting of three lights, which shall be arranged, at a distance of not less than 6 feet apart, in the form of an equilateral triangle, and of which the light at the apex of the triangle shall be white, and the other lights at the ends of the base of the triangle shall be red in color.

**Anse du Choc** (14° 03' N., 61° 00' W., *H. O. Chart 1261*) is a bight about 3 miles in length between Port Castries and Labrelotte Point to the northeastward in which a vessel may anchor in 6 or 8 fathoms (11.0 to 14.6 m.) of water, to the westward of Choc or Rat Islet (on which the Yaws Hospital now stands); near the center of the bay.

About ½ mile northeastward of Choc Islet is the entrance to the Choc or Union River.

**Reef.**—In the northern part of the bay is a sunken reef, which generally breaks, about 1,200 yards in length in a 20°–200° direction and less than 200 yards in breadth. Its northern end is in Labrelotte

Bay, and its southern end about 1,700 yards northward of Choc Island.

**Danger range.**—Keep the whole of Pigeon Island open of Labrelotte Point to avoid this reef and the shoal patches southward of it. Point to avoid this reef and the shoal patches southward of it.

**Gros Islet Bay** is about 4 miles northward of Port Castries, and affords good anchorage. It is formed between Foureur, a round rock 18 feet (5.5 m.) high, on the south, and Pigeon Island on the north. These two islets lie northeast and southwest distant  $1\frac{1}{2}$  miles from each other, and measured from this line the bay is about 1 mile deep.

There is a passage for small craft between Foureur Islet and the mainland.

**Pigeon Island** is bold and steep-to, 341 feet (103.9 m.) high, 800 yards in length, and 400 yards in breadth. On its southern hill is Fort Rodney, and at its eastern end are the ruins of military quarters, and a very old tank, containing good drinking water. It is about  $\frac{1}{2}$  mile from the shore, with about 1 fathom (1.8 m.) of water in the channel between.

**Burgot Rocks**, 37 feet (11.3 m.) high, two in number, lie  $\frac{1}{4}$  mile northeastward of Pigeon Island. Between them and the shore the water is shallow.

**The village** of Gros Islet stands on its eastern shore and is connected with Port Castries by a good road about 7 miles in length. There is a watering place in Gascon Creek, in the southern part of the bay.

**Landmark.**—A conspicuous white cross 105 feet (32.0 m.) above water is located about  $\frac{1}{4}$  mile behind the village.

**Directions.**—As there is no danger in entering Gros Islet Bay, both islets may be rounded at 200 yards distance. A sailing vessel will most probably have to beat in; the best anchorage will be found in the portion of the bay known as St. Croix Roadstead, with Gros Islet church in range with a conical hill, 314 feet (95.7 m.) in height, over Beau Sejour estate, bearing  $99^\circ$ , and the western extremity of Pigeon Island  $0^\circ$ , in 10 fathoms (18.3 m.) of water.

**ST. VINCENT ISLAND** ( $13^\circ 07'$  to  $13^\circ 22' N.$ ,  $61^\circ 07'$  to  $61^\circ 17' W.$ , *H. O. Chart 1279*) was discovered by Columbus on January 22, 1498, being St. Vincent's day in the Spanish calendar, from which it takes its name. It has been in the possession of Great Britain since 1783. The island is oval shaped, about 15 miles in length north and south,  $9\frac{1}{2}$  miles in extreme breadth, and contains an area of 150 square miles. The government is vested in an administrator, who is subordinate to the governor of the Windward Islands, assisted by an executive and legislative council.

**Aspect.**—The island is of volcanic origin, and has a backbone of thickly wooded mountains running north and south. At the northern end of this range are the Soufriere Mountains, rising abruptly from the northwestern shore to a height of 4,048 feet (1,233.8 m.). The southern end of the range terminates in Mount St. Andrews 2,433 feet (741.6 m.) high. Spurs break off from this range on each side, breaking the island up into a series of valleys.

The coast is bold and steep to with the 100-fathom (182.9 m.) curve less than 1 mile offshore except on the southeastern coast, where it is 3 miles from the coast.

**Anchorage.**—The shores are generally bold and rocky, intersected, however, by sandy bays, off which droghers find temporary anchorage for the purpose of shipping the produce of the neighborhood to Kingstown, the capital of the island. Kingstown Bay and port is the only anchorage of any importance. It is well sheltered from the trade winds, and is available at all times for all classes of vessels.

**Climate.**—The climate of St. Vincent is considered to be healthy and is divided into two seasons—the dry, from December to July, and the wet during the remainder of the year. The temperature varies from 60° to 88° F.

**Current and tides.**—A survey in 1889 showed the main current within a distance of 5 miles of St. Vincent was always found setting to the northward, but within a mile of the coast tidal influence is felt;  $\frac{1}{2}$  mile southward of Calliaqua, Cane Garden, and Johnson Points, the flood current runs west and northwest about 2 knots, and the ebb to the southward and southeast 1 knot, at springs, the currents apparently turning at high and low water by the shore, but subject to great irregularities from wind and current.

**Earthquakes.**—After being tranquil since 1718, a tremendous eruption of the Soufriere took place on April 30, 1812; and again on May 7, 1902, a great eruption took place, in which about 1,300 people lost their lives and a large portion of the island was devastated.

**Population.**—The estimated population was 53,000 in 1928.

**KINGSTOWN BAY** ( $13^{\circ} 09' N.$ ,  $61^{\circ} 14' W.$ , *H. O. Chart 1161*), the principal anchorage, is at the southwestern end of St. Vincent. It is nearly 1,500 yards deep and formed by Battery or Old Woman Point on the northwest and Cane Garden Point, distant  $1\frac{1}{4}$  miles to the southeastward.

Fort Charlotte, with the barracks, hospital, and the flagstaff on Old Woman Point, being 637 feet (194.2 m.) high, give it a most commanding appearance. (See view 21, Appendix V.)

**Depths.**—The water is deep all over the bay and there are depths of 18 to 20 fathoms (32.9 to 36.6 m.) about  $\frac{1}{4}$  mile from the town.



A small ledge above water, named the Gimblets, extends from Johnson Point immediately northwestward of it.

**Kingstown Harbor Lights.**—A fixed white light, 640 feet (195.1 m.) above high water, visible 3 miles, is exhibited from a white shed with a red roof at Fort Charlotte, and two red lights from the landing jetty. (See Light List.)

**Signal station.**—There is a signal station at Fort Charlotte.

**Anchorage.**—The best anchorage is in 10 fathoms (18.3 m.) of water, dark sand and good holding ground, at about  $\frac{1}{4}$  mile from the shore. If more convenient, a berth will be found farther out in 20 fathoms (36.6 m.), with Old Woman Point  $287^{\circ}$  about 1,600 yards distant.

As the wind during the middle of the day frequently blows down the valleys with great violence, be prepared to give the vessel a good scope of chain, or she may drift off the bank. At night the breeze generally falls light, a weather current sets round the bay, and should the anchorage be crowded it may be necessary to steady her with another anchor.

**Weather.**—The usual trade-wind weather prevails. A hurricane visited St. Vincent on September 11, 1898, the center passing over Kingstown. The storm, which was of more than usual violence, was apparently of small diameter. Enormous damage was done to shipping and other property.

**Tides.**—The high-water interval at Kingstown Bay is 2h. 50m. Mean range of tides 2 feet (0.6 m.), spring range 2.7 feet (0.8 m.). Both flood and ebb currents set around the bay with a velocity of about  $\frac{1}{2}$  knot. The flood commences to make at about 3 hours before high water and the ebb 3 hours after high water.

**Pilotage** is not compulsory or necessary.

**Directions.**—Kingstown Bay has no dangers, and may be entered from the northward or southward by a steamer.

It is generally approached from the southeastward by a sailing vessel. Having closed with the southern point of St. Vincent, which slopes gradually, steer along the land at the distance of about a mile, when Young and Duvernette islets, on the northwestern side of Calliaqua Bay, and the high land over Kingstown will be seen, and shortly the high bluff of Battery or Old Woman Point will come open.

Duvernette, the outermost of the two islets, is a small, round sugar-loaf islet, 204 feet (62.2 m.) high, covered with vegetation and having an old fort on its top. Pass this islet from a half to 1 mile off and haul in for Cane Garden Point, the southeastern extremity of Kingstown Bay, which slopes gently toward the sea, bearing in mind that foul ground (Washing Rock) extends for 100 yards off the point 550

yards southeastward of it and that there are strong tide rips off Cane Garden Point.

If bound into the bay in a sailing vessel haul close round Cane Garden Point, but take care not to be taken aback, and look out for the lofty sails, as the wind is often scant and unsteady and the squalls from the high land are heavy.

If coming from the northward, rounding Johnson Point, it should be given a wide berth, as a current of as much as 2 knots has been experienced setting toward the point.

**KINGSTOWN** ( $13^{\circ} 09' N.$ ,  $61^{\circ} 14' W.$ , *H. O. Chart 1161*).—The town, which has a pleasing appearance, stretches along the head of the bay, close to the water; in its rear the mountains gradually rise in a semicircle. About a mile from the town is the botanic garden, ascending from a level to a steep hill, with a mountain stream forming its northern boundary. Near the upper part of the garden stands the governor's house, commanding a beautiful view, with Kingstown below it, and in front the Grenadines in the distance.

**Repairs.**—There are no facilities for making repairs to ships.

**Wharves.**—There is a private wharf equipped with a 5-ton crane, with depths of about 12 feet (3.7 m.) at its outer end.

Cargo is handled by means of lighters and is usually landed on the shore.

**Supplies.**—Fresh beef and vegetables may be obtained. Water may be conveniently obtained from a pipe on the pier and is free of charge to naval vessels on application to the port office.

Coal and fuel oil can not be obtained.

**Communication.**—There is regular steamer communication with England, New York, West Indian ports, British Guiana, Bermuda, Sweden, and Canada.

There is telegraphic communication with all parts of the world via other islands of the West Indies.

**Radio.**—A radio station, wave length 900 meters, is located at Kingstown Bay.

**Hospital.**—The Colonial Hospital is recommended for seamen. It is sanitary and well equipped.

**Calliaqua Bay** ( $13^{\circ} 08' N.$ ,  $61^{\circ} 12' W.$ , *H. O. Chart 1161*), about 2 miles southeastward of Cane Garden Point, was formerly much frequented by merchant vessels, but now Kingstown is the principal shipping place. It will be known by Young and Duvernette Islets on the western side, and in the interior, some distance above the village, in a commanding position, is the lookout. The bay has a convenient sandy beach for shipping cargo. Two rivulets run into it and the anchorage is secure. The village is small. See view 21, Appendix V.)

Between Young Island and the mainland is a channel carrying from 5 to 8 fathoms (9.1 to 14.6 m.), but only about 70 yards wide at the narrowest part, between the reefs bordering both sides. Anchorage for small vessels can be obtained in the carenage, to the northward of Young Island.

**Lagoon.**—On the eastern side of this bay is a snug little harbor protected by the reefs, with 6 to 9 fathoms (11.0 to 16.5 m.) of water, mud bottom, but the entrance through the reef from the southwest has a depth of only 2 fathoms (3.7 m.).

**WEST COAST—Bucament Bay** ( $13^{\circ} 11' N.$ ,  $61^{\circ} 17' W.$ , *H. O. Chart 1279*), northwestward of Kingstown Bay, is noted for the stream of excellent water which flows into it. It has a depth of 26 fathoms (47.5 m.) across its entrance, within 100 yards of the shore; vessel may anchor at that distance offshore, a little to the northward of the river, in 17 fathoms (31.1 m.) of water.

**Layu Bay.**—About 3 miles to the northwest of Johnson Point is Layu Bay, with depth of 20 to 25 fathoms (36.6 to 45.7 m.) at 100 yards from the shore. The southeastern point is steep-to, and this side of the bay is sandy; the northwestern side is rocky, and a small reef extends from the point.

**Barrualli Bay** lies about  $5\frac{1}{2}$  miles to the northwestward of Kingstown. Its northern side is formed by some remarkable rocks, named the Bottle and Glass; the former was nearly demolished by blasting to widen the boat channel within them.

The bottom on the northern side of the bay is foul. The wind is so variable and unsteady under the high land that, if intending to remain any time, it will be better to warp in and drop a second anchor to the eastward in about 12 fathoms (21.9 m.).

**Directions.**—If coming from the northward and entering this bay in a sailing vessel, haul close round these rocks and anchor in 20 fathoms (36.6 m.) of water, sandy bottom, with the rocks bearing  $313^{\circ}$  and the barracks  $60^{\circ}$ .

If approaching from the southward, the shore may be kept aboard equally close, and the vessel may probably shoot far enough in to drop the inner anchor first. The water being deep so close in, the anchorage is only fit for small vessels.

**Water** may be obtained from a stream at the head of the bay.

**Chateau Belair Bay.**—From Bottle and Glass Rocks to Chateau Belair Bay the shore is bold, and vessels may stand in to  $\frac{1}{2}$  mile from the coast. Between these places there are four small bays, Wallilabu, Cumberland, Trinuka, and Petit Bordel, in which only coasting craft can anchor.

On Chateau Belair Bay rather larger vessels may find anchorage about 400 yards  $20^{\circ}$  from the pier in depths of 13 to 14 fathoms (23.8 to 25.6 m.), sand. Outside this position the bay is very deep. The landing is not good, and with northerly winds a heavy surf rolls in on the beach.

**Chateau Belair Islet**, on the western side of the bay, is 232 feet (70.7 m.) high, with a rock 7 feet (2.1 m.) high close to its southern point; the narrow passage southward of this rock has a depth of 6 fathoms (11.0 m.); it is used by boats and sometimes by droghers.

**Wallibu Village**, about  $1\frac{1}{2}$  miles northward of Chateau Belair, has exposed anchorage in 17 fathoms (31.1 m.) about 150 yards off-

shore, with the extremity of Chateau Belair Islet just open. In fine weather this anchorage may be used as a starting place for visiting the craters; landing is indifferent, but canoes that safely land passengers can be hired.

**Caution.**—To navigate under the lee of high land is generally extremely tedious and uncertain. A sailing vessel may be becalmed for hours or, indeed, days when the trade wind is light. When it is strong, precaution is necessary, and the mariner should be prepared for the sudden gusts which blow with violence down the valley; but sometimes when the trade wind is blowing strong on the weather side of the island a gentle sea breeze is experienced on the lee side. As the anchorages generally lie close to the shore, and the banks extend but little off and steep-to, if taken aback there may be some danger of getting on the rocks; the boats should therefore be ready to tow. Anchors alone must not be depended upon.

**NORTH COAST** (*H. O. Chart 1279*).—The part of the island northward of a line from Chateau Belair to Black Point, on the east coast, is known as the Carib Country. The only land communication from the east to the west side of the island here is by a track over the Soufriere, practicable for horses part of the way. Native boats frequently go around from one side to the other.

**De Volet Point.**—From Wallibu to De Volet Point, which stands out prominently, distant  $3\frac{1}{2}$  miles, the coast is remarkable, chiefly for its numerous and varied sharp spurs. Morne Ronde Point, 154 feet (46.9 m.) high, about a mile north of Wallibu, shows as a hummock from the southward, and has a village near it. A chain of small rocks just out 50 yards from Larikai Point.

There is good landing on the sandy beach in Grand Baleine  $\frac{1}{2}$  mile eastward of De Volet Point, and also good water there. Quashie Point or Cape Rolle (locally, Cooper Hole) is bold and prominent. Booby Rock, near the northern extremity of the island, is 10 feet (3.0 m.) high, with Fancy Pass inside, that may be used by boats in fine weather.

**Porter Point**, 68 feet (20.7 m.) high, is sharp and conspicuous. In Owia Bay there is temporary anchorage in fine weather for small droghers.

**Owia Point**, the northeast extremity of St. Vincent, is 245 feet (74.7 m.) high, with the houses of the estate on its summit.

**Cows and Calves**, a chain of rocks, the highest elevated 45 feet (13.7 m.), lie off this point.

**Espagnol Point** is similar in shape to Owia Point, but without the well-defined summit, and it has no buildings on it.

The whole of the coast between Kingstown and Owia Point is free from outlying dangers, and may be approached to  $\frac{1}{2}$  mile.

**EAST COAST** (*H. O. Chart 1279*).—The eastern coast of St. Vincent is free of outlying dangers, and is generally steep-to, but does not possess any secure anchorage. Southward of the Cow and Calves is Myrtle Bay, with Espagnol Point at its southern extremity.

From Espagnol Point the coast turns abruptly to the southward, and as far as Turema Point the country is cut by spurs and ravines, like those on the northern coast. Between Turema Point, 70 feet (21.3 m.) high, and Black Point the spurs are comparatively broad and flat, rising in gentle slopes toward the Soufriere and Morne Garu Mountains. This part of the coast is lined with boulders, on which the sea breaks heavily.

**Georgetown** may be recognized from seaward by its square church tower, built of dark-colored volcanic stone.

**Piers.**—There are wooden piers at Robaka and Georgetown, from which sugar is shipped in boats especially constructed for the purpose.

**A buoy**, to which droghers moor, lies off each pier. The piers and buoys are private property.

**Black Point**, dark in appearance and well defined, is 54 feet (16.5 m.) high at its extremity, and easily recognized as the first point southward of Georgetown. Colonaire Point and Yambu Head are prominent points between Black Point and Milligan Cay, at the southeastern extremity of the island.

**THE GRENADINES** (*H. O. Chart 1640*).—This chain of about 100 islands and rocks extends for 60 miles between the islands of Grenada and St. Vincent. They were discovered with the adjacent islands by Columbus in 1498 and were probably settled about the same time as Grenada by the French, in 1650. They are now part of the British West India possessions.

They are of moderate height, none exceeding 1,110 feet (335.3 m.), and free from outer dangers, so as to render an approach to them safe either by day or moonlight nights, and there are several channels between them. The eastern edge of the bank, or 100-fathom (182.9 m.) curve, is 10 miles from the islands, with depths between ranging from 10 to 25 fathoms (18.3 to 45.7 m.), while the bank to the westward does not extend nearly so far.

**Tides and currents.**—In this channel, between Bequia and St. Vincent, the current almost always sets to the westward near the middle, but the ebb or east-going current prevails in a less depth than 70 fathoms (128.0 m.).

At 6 h., full and change, the ebb current begins to run to the eastward, and advantage may be taken of it to work to windward during its continuance under the lee of Bequia, on the St. Vincent shore, and between Bequia and the weather islets or cays; but a

vessel will have little chance of making easting when the currents are setting westward. When the ebb current sets to windward along the shore of Bequia Island against a strong trade wind a heavy confused sea will be found in this channel.

The strength, duration, and general direction of the tides among the Grenadines are very much influenced by local causes, but generally in the course of 24 hours there are two tides each way. It is generally high water, full and change, at 3h. 00m., the tide seldom rising and falling as much as 1 foot (0.3 m.). The flood or tide setting to the westward is aided and accelerated by the westerly equatorial current, and in proportion as this takes place the ebb stream to the eastward is retarded or overcome.

The direction of the tides is governed to a great extent by the direction of the trade winds, which, although they do not vary much from the east, still affect the tide.

The flood tide is usually of longer duration than the ebb, and in mid-channel will sometimes, aided by the current, run all day, while close to the islands the ebb tide may be found running to the eastward.

When the ebb tide runs against a strong trade wind a heavy confused sea is raised.

The average velocity of the tidal current in the channels is about 2 knots and in some places 3 knots. Sometimes, however, aided by the current, the flood tide rushes through the passages at the rate of 4 knots.

**BEQUIA ISLAND** ( $13^{\circ} 00' N.$ ,  $61^{\circ} 15' W.$ , *H. O. Charts 1279 and 1640*) is 88 feet (268.2 m.) high,  $6\frac{3}{4}$  miles in length in a general northeast and southwest direction, and from 1 to  $1\frac{1}{2}$  miles wide in the middle, decreasing with an irregular coast line and several bays to a point at both ends. It lies 5 miles southward of St. Vincent, and the same distance northwestward of Baliceaux. The population is about 900. No supplies can be obtained; water is scarce and poor. A magistrate, whose district includes all the neighboring islets and cays, and a clergyman of the Established Church of England reside here.

**Admiralty Bay** ( $13^{\circ} 00' N.$ ,  $61^{\circ} 15' W.$ , *H. O. Chart 358*), on the western side of Bequia Island, the principal anchorage, is about 1,500 yards deep, and in the inner part near the head, which is narrowed by shallows on either side, a vessel would be well sheltered from all winds except those from the southwest, and when the wind is blowing from this direction, which is an exceedingly rare occurrence, the vessel would, in a measure, be protected from the sea, as it would be broken in passing over the Belmont Shallow and the two banks projecting from the northern side of the bay.

The inner part of the bay is not large, but deep enough for any vessel, and the channel to it between Belmont Shallow, bordering the shore of the bay on the south, and the opposite bank is clear, distinct, and traceable from its darker color and deeper appearance. This part of the bay could only be entered by a large vessel under steam or by warping; the water is quite smooth, and small vessels work in.

**Piers.**—There are two small piers at the head of the bay.

**Landmark.**—There is a very conspicuous square white house, with a dark roof, two windows and a door, 290° 50 yards from the magistrate's house.

**Tony Gibbons Bay** is situated southeastward from Admiralty Bay and is not protected from the westward. (See note on Chart.)

**Dangers.**—**Wash Rock** lies in the northern approach to Admiralty Bay at about 100 yards off the northern point of Rocky Bay. The town of Kingstown, or Mount St. Andrew, in the island of St. Vincent, open of the northwestern point of Bequia, bearing 12° or eastward of that bearing, leads clear of the rock. (See view B on H. O. Chart 358.)

**A patch** with 18 feet (5.5 m.) of water over it lies 350 yards 141° from the eastern point of Rocky Bay.

**Belmont Shallow** extends 350 yards off the southeastern shore, and has patches of 1 to 5 feet (0.3 to 1.5 m.) near its 3-fathom (5.5 m.) edge. The deep-water fairway between it and the 3-fathom (5.5 m.) curve east of the 18-foot (5.5 m.) patch is about 200 yards wide.

**Directions.**—In entering Admiralty Bay from the northward, after clearing Wash Rock, observe care to keep to the southward of the 18-foot (5.5 m.) spot until the magistrate's house (situated about the middle of the head of the bay and partially concealed by the vegetation) is in range with the notch on the hill, bearing 62°. (See view A on H. O. Chart 358.) This range will lead into the inner anchorage in a least depth of 40 feet (12.2 m.). Or a vessel can anchor in the outer part of the bay in about 100 feet (30.5 m.).

**Friendship Bay** (12° 59' N., 61° 15' W., *H. O. Chart 1640*), a circular indentation about 700 yards across on the southeastern side of Bequia, offers good shelter for small vessels of 10 feet (3.0 m.) draft. It is formed by St. Elair Point on the east and by the cay, 71 feet (21.9 m.) high, of the same name, and connected to the main island by a reef on the west; the route is midway between the two.

**Quatre Isle.**—Quatre Isle, with a population of about 50 people, 2,300 yards southward of Bequia, is 460 feet (140.2 m.) high, 1½ miles in length, narrow, with an indentation on the northwest and one or two projecting points on the east and south, forming little bays.

**Pigeon Islet**, 220 feet (67.1 m.) high, lies 700 yards off its western end.

**Petit Nevis**, 325 feet (99.1 m.) high, is a small island, 600 yards northward of the Quatre Isle and 1,200 yards southward of Bequia. A sunken rock lies about 200 yards south of the most southern point of Petit Nevis.

**Semples Cay**, 64 feet (19.5 m.), lies in the middle of the channel between Petit Nevis and Bequia.

**Anchorage.**—The above-mentioned islets and cays with the southern part of Bequia to the northward, inclose a large space, with moderately smooth and everywhere deep water, forming an open but safe anchorage at any time, excepting the hurricane season; even then, with steam power, it is as safe as any other place, and there is no difficulty in leaving it at all times.

There are four channels formed by these islets and cays which may be taken either way by steamers, but under sail should only be used from east to west with a commanding breeze, as the currents are strong. As a general rule, pass in the middle of each channel, except between Quatre Isle and Petit Nevis, where the former should be favored to avoid the submerged rock, on which the sea generally breaks. But as little can be gained either in distance or position by taking either of these small channels, neither of them should be used unless in cases of necessity.

Between this group and that to the eastward the depth of water is uniform, being about 20 fathoms (36.6 m.), the only danger being Montezuma Shoal,  $\frac{1}{2}$  mile from Mustique Island.

**Battowia Island.**—About  $6\frac{1}{2}$  miles eastward of Quatre Isle is the bold-looking, precipitous island at Battowia, 686 feet (209.1 m.) in height, with the Bullet, an isolated islet 318 feet (96.9 m.) high, close off its northern end, shaped somewhat like a conical bullet. (See view 22, Appendix V.)

To the northwestward of the Bullet, distant 300 yards, and about the same distance from the northern point of the island, is a rock which breaks. It was to this island that most of the Caribs were sent when captured in the St. Vincent War, before their final deportation to Ratan and Honduras.

**Bank.**—The 100-fathom (182.9 m.) curve of the bank is about 4 miles eastward of Battowia, and continues its northern direction for about 10 miles north of that island; it then trends in the direction of and passes close to Bequia without joining the St. Vincent Bank. In the channel between the two islands the space between the two banks is, however, only about  $11\frac{1}{2}$  miles wide and not over 300 fathoms (548.6 m.) deep.

**Baliceaux Island**,  $11\frac{1}{4}$  miles in length by  $\frac{1}{2}$  mile wide and 430 feet (131.1 m.) high, lies close southwestward of Battowia Island, with which it is connected by a shoal with a greatest depth of 3 fathoms (5.5 m.). (See view 22, Appendix V.)



A bank extends off its western side, on the edge of which with caution a vessel may anchor in 4 to 6 fathoms (7.3 to 11.0 m.), but the water is never smooth, although there is no danger for vessels of small draft closer in. There are two shallow patches close in on the northwest and a reef uncovered on the southwestern side of the island.

The landing place is near the only house on the island and just to the right of a grave with iron railings round it; the landing is not very good on account of the surf.

**Cactus Cay.**—At the northern end of the island is Cactus Cay, 63 feet (19.2 m.) high, and at  $\frac{1}{4}$  mile northward of it is Black Rock, 41 feet (12.5 m.) high, with a 2-fathom (3.7 m.) shoal between.

Between the islands of Baliceaux and Battowia is Church Cay and Reef. The narrow channels carrying 2 fathoms (3.7 m.) of water on either side of it are fit only for small vessels with a fair wind.

**All-awash Islet.**—At  $1\frac{1}{4}$  miles southward of Baliceaux Island is the prominent islet or rock called All-awash, 223 feet (68.0 m.) high, steep-to, and which can be passed on either side. A vessel can work to windward here with the assistance of the ebb tide. (See view 22, Appendix V.)

**The Pillories** are three islets in a  $66^{\circ}$ – $246^{\circ}$  direction, over a space of about 1,300 yards. They are about  $2\frac{1}{2}$  miles southwestward of Baliceaux Island; the western inlet is 65 feet (19.8 m.) high, the middle 85 feet (25.9 m.), and the easternmost and largest 190 feet (57.9 m.). Between these islets and Single Rock is a narrow passage carrying 3 fathoms (5.5 m.) of water. The above channels may be taken by small vessels from east to west, but only in cases of urgent necessity.

**Pillory Rocks** are a group of rocks partly uncovered, and the largest is 70 feet (21.3 m.) high  $68^{\circ}$  from Great Pillory. Between them and the islets there is a clear channel 700 yards wide, with 8 and 9 fathoms (14.6 and 16.5 m.) of water; except there is a sunken rock with 8 feet (2.4 m.) of water on it, and which generally breaks, 1,300 yards  $118^{\circ}$  from Great Pillory; and at only  $\frac{1}{2}$  mile from Great Pillory in almost the same line is another rock, with  $1\frac{1}{4}$  fathoms (2.3 m.) over it, which always breaks.

**Mustique Island**,  $2\frac{1}{2}$  miles in length by 1 mile in breadth, and at its southern end 495 feet (150.9 m.) high, lies about 6 miles south-eastward from Bequia Island. About 1 mile southward is Petit Mustique, with a channel of 7 fathoms (12.8 m.) between, which, with the exception of reefs, its southern part is clear of danger. There is a  $1\frac{1}{2}$ -fathom (2.7 m.) spot, on which the sea breaks, lying  $\frac{1}{2}$  mile eastward from the south point of Mustique. (See view 22, Appendix V.)

The eastern side of the island is skirted by reefs, and off it is Rabbit Islet, Brooks Rock, 60 feet (18.3 m.) high, and other rocks; but as there is no anchorage, a vessel should avoid this side of the island.

**Montezuma Shoal** is about 350 yards in diameter, with only 3 feet (0.9 m.) of water on it, and lies  $\frac{1}{2}$  mile from the northern extremity of Grand Bay, or the middle point of the island. This shoal is extremely dangerous, as when the water is smooth it does not break and can not be seen until too late to avoid it.

**Anchorage.**—In anchoring in Grand Bay, on the western side of the island, a vessel should pass west and north of Montezuma Shoal, and enter between it and the northern point of the bay, or make short tacks in the southern part of the bay. A vessel may also anchor northward of the shoal off Cheltenham.

**Rocks.**—Close off the northern end of Mustique is Double Rock, 20 feet (6.1 m.) high, and 700 yards farther is Single Rock, 15 feet (4.6 m.) high; the channel between the rocks has from 7 to 8 fathoms (12.8 to 14.6 m.) of water. One-half mile eastward of the southern end of Mustique Island is a submerged rock with  $1\frac{1}{2}$  fathoms (2.7 m.) of water over it.

**Petit Mustique** ( $12^{\circ} 50' N.$ ,  $61^{\circ} 12' W.$ ; *H. O. Chart 1640*) is 340 feet (103.6 m.) high and about  $\frac{1}{2}$  mile in length. A rock uncovered lies 200 yards off the southern point of the islet, and another rock 1 foot (0.3 m.) above water 800 yards southwestward of its western end, leaving a narrow channel between the latter and the island. (See view 22, Appendix V.)

**Petit Cay**, 75 feet (22.9 m.) high and surrounded by a reef, lies at about  $\frac{1}{4}$  mile off the northern extremity of the islet. The water is shoal for about 300 yards north of it.

**Savan Islets** form a group of small islets and rocks extending north and south over the space of a mile lying 2 miles southwestward from Petit Mustique. The largest islet is about 600 yards long, 200 yards wide, 133 feet (40.5 m.) high, and, being covered with grass, has a bright green appearance when seen in the sun. (See view 17, Appendix V.)

**Savan Rock**, 105 feet (32.0 m.) high, is remarkable for having whitish sides and somewhat the appearance of Sail Rock (to the southward), but from its being the southern of this group it can not be mistaken for the isolated Sail Rock. These islets and rocks are more or less skirted by reefs and rise from a bank having from 4 to 10 fathoms (7.3 to 18.3 m.) of water on it. (See view 17, Appendix V.)

Temporary anchorage will be found for small vessels northwestward of the largest islet, but there is always a swell. The channel between this group and Petit Cannouan is about  $3\frac{1}{2}$  miles in breadth and clear of danger.

**Petit Cannouan** ( $12^{\circ} 48' N.$ ,  $61^{\circ} 17' W.$ , *H. O. Chart 1640*) is  $3\frac{1}{2}$  miles westward of Savan Rock. It is 600 yards long, 400 yards wide, and rises 222 feet (67.7 m.) with 10 to 16 fathoms (18.3 to 29.3 m.) of water around it. Between it and Cannouan there is from 17 to 23 fathoms (31.1 to 42.1 m.) and no dangers. (See view 17, Appendix V.)

**Cannouan Island** is of an irregular outline,  $2\frac{3}{4}$  miles in length north and south, and its northern part  $1\frac{1}{2}$  miles in breadth, where it rises to a peak 853 feet (260.0 m.) above the sea, but the middle part is not so high, and in one place not more than  $\frac{1}{4}$  mile across; the southern part projects westward and forms on that side Charlestown Bay, where there is anchorage. The island is more or less bordered by reefs, and on the southeastern and southern sides they extend off to about  $\frac{1}{2}$  mile. (See view 18, Appendix V.)

Both the northwestern and southwestern points of the island are bold and may be passed at the distance of 200 yards; but it is not advisable to go that near the northwestern point in a sailing vessel, as the Peak checks the wind and causes flaws and eddies, but this will not occur near the southwestern point. The population of the island is about 600.

**Anchorage.**—A large vessel should anchor in Charlestown Bay in 17 fathoms (31.1 m.) of water, sand, with the tangent of the northwestern point bearing  $19^{\circ}$  and the southwestern point  $231^{\circ}$ . Small vessels may anchor close inshore. Within the 15-fathom (27.4 m.) curve the water shoals suddenly.

To the northward of Friendship Point, the southeastern extremity of the island, there is secure anchorage for small vessels inside a sandy cay and the reef. It should be approached from the southwestward with smooth water. If the wind be fresh, a vessel should not attempt to pass Friendship Point, as it fronts the channel formed by an open space in the reef eastward of it, or to enter by this eastern channel; a pilot with local knowledge should be obtained. Anchorage will also be found westward of Dove Cay.

**Bank.**—About 1,300 yards  $293^{\circ}$  from the northwestern point of Cannouan Island is a small bank with  $6\frac{1}{2}$  fathoms (11.9 m.) of water on it. Vessels of large draft should avoid it, as with the heavy swell, and the doubt which always exists as to whether the shallowest water is absolutely known, it will be more prudent.

**Channel Rock** lies in the channel between Mayero and Cannouan Islands. It is small and 8 feet (2.4 m.) high; is bold and steep-to and may be approached to within 400 yards.

About 900 yards southwestward of Channel Rock is a rock awash with deep water all around.

**Mayero Island.**—The next group southward consists of Mayero Island, Catholic Islet and rocks, and Tobago Cays and Reefs. Mayero Island, 347 feet (105.8 m.) high, is the largest, about  $1\frac{1}{2}$  miles in length, nearly 1 mile in extreme breadth, and contains about 300 inhabitants.

**Catholic Islet and Rocks** are about 1 mile northwestward of Mayero Island; the islet is 166 feet (50.6 m.) high, and the rocks, about  $\frac{1}{4}$  mile to the southwestward of it, 77 feet (23.5 m.) high; the passage between them has  $5\frac{3}{4}$  fathoms (10.5 m.) of water, and may be taken with a fair wind in cases of necessity.

At 400 yards northwestward of Catholic Rocks is a shoal with  $3\frac{1}{2}$  fathoms (6.4 m.) of water on it, which must be avoided. A rock 8 feet (2.4 m.) above water and a small sand cay, called Dry Shingle, are connected to the islet on the eastern side by a bank which encircles it. Between Mayero Island and Dry Shingle is a good channel nearly 600 yards in width and with 5 fathoms (9.1 m.) of water for vessels from the northward for Mayero Anchorage. (See view 27, Appendix V.)

**A wreck**, with one mast showing 15 feet (4.6 m) above the water, lies sunk off the western side of Mayero Island, about  $1\frac{1}{4}$  miles southward of Catholic Islet.

**Anchorage** ( $12^{\circ} 39' N.$ ,  $61^{\circ} 22' W.$ , *Plan on H. O. Chart 1640*).—Good anchorage in 6 or 7 fathoms (11.0 to 12.8 m.) of water may be had on a bank extending about 1,500 yards westward from Mayero Island.

The best and most roomy berth for leaving with any wind is near the edge of the bank with the middle of the island bearing  $68^{\circ}$ , but as the trade wind is almost always between northeast and southeast, a vessel may anchor much closer in out of the swell, taking care, however, to avoid a 3-foot (0.9 m.) shoal 300 yards off the middle point of the island. The northwestern point of Cannouan Island, well open of the northwestern point of Mayero, leads to the westward of the shoal; the two points in range lead on it. In working for this anchorage keep on the parallel of Mayero.

On the eastern side of Mayero Island is a secure anchorage for small vessels in from 6 to 9 fathoms (11.0 to 16.5 m.) of water under cover of the extensive reefs which surround this side of the island. The passage in is from the southward, between the reefs on the east and those skirting the shore of the island.

**Tobago Cays.**—At  $1\frac{1}{4}$  miles eastward of Mayero Island are four small islets called Tobago Cays. They extend over a space of about 1,500 yards; three of them are nearly in range north and south, the two northernmost being the largest, and the middle one 150 feet (45.7 m.) high; the fourth islet is east of the middle one. They are

within a semicircular reef, just awash, named the Horseshoe, the extremities of which are nearly  $2\frac{1}{2}$  miles north and south of each other. There are two small sand banks about 2 feet (0.6 m.) above water rising from the reefs about 700 yards southwestward and southeastward of the islets. The space between these cays and Mayo Island is also filled with reefs having narrow channels between them.

Good anchorage for small vessels, in smooth water, will be found under the lee of the cays and between them and Horseshoe Reef, the latter forming a perfect breakwater.

**Directions.**—The route to the anchorage is from the northward, between Baline Reef, at the northwestern end of the Horseshoe, and Mayo Island, keeping nearer the latter to avoid a rock with 6 feet (1.8 m.) of water on it lying 500 yards  $212^\circ$  from the Baline Reef. Small vessels may pass between Baline Reef and the northwestern end of the Horseshoe. A vessel may leave the anchorage by the channels to the southward, but a sailing vessel can not well enter by them.

**Worlds End Reef** (*H. O. Chart 1640*).—The most eastern danger belonging to the group of the Tobago Cays and reefs is the Worlds End Reef, which lies in an east-southeastward direction and its eastern extremity distant nearly  $2\frac{1}{2}$  miles from the highest of the islets. It is  $1\frac{1}{3}$  miles in length, about 1,500 yards in breadth, and dangerous for sailing vessels to be near in light winds, as the current sets strong over it.

**Egg Reef and Sandy Cay.**—Close to the westward of Worlds End is Egg Reef, separated by a narrow passage, and westward of the latter is Sandy Cay, with a tree on it, encompassed by a reef above water, with channels on either side of it. The cay is 6 feet (1.8 m.) high and the tree 20 feet (6.1 m.). These channels are narrow, deep, and may be taken in case of necessity. There is anchorage sheltered from the north under the lee of Egg Reef. Vessels should, however, avoid the vicinity of the whole of these reefs eastward of Tobago Cays, as the tides are strong.

**Sail Rock** is a small islet or rock 203 feet (61.9 m.) high, rising from the southeastern end of a small bank, with 9 fathoms (16.5 m.) water over it, immediately within the 20-fathom (36.6 m.) curve. It is  $3\frac{3}{4}$  miles eastward of Worlds End Reef, clear of danger, and bottom will be found on the edge of the great bank at the distance of 5 miles eastward.

**Channel.**—The widest and best channel to the westward, when near and southward of Sail Rock, is between the reefs bordering Little St. Vincent and Prune Island north of them; or, if more convenient, a vessel may pass southward of Worlds End Reef and

between Union Island and the Mayo Group. But if a more northerly course is preferred the channel between the latter group and Cannouan Island may be taken. In pursuing this latter route a vessel should pass about 800 yards northward of Channel Rock.

**Currents.**—The flood tide runs through these channels at from 2 to  $2\frac{1}{2}$  knots and the ebb to the eastward at from 1 to  $1\frac{1}{2}$  knots.

**Union Island** ( $12^{\circ} 36' N.$ ,  $61^{\circ} 26' W.$ ) lies southwestward of Mayo Islands, and is the southernmost of those islands attached to the government of St. Vincent. The island is nearly 3 miles long east and west by 2 miles wide and 1,010 feet (307.8 m.) high. It is more or less skirted by reefs which connect it to Frigate Islet, distant about 1,300 yards on the south, and Red Islet, 140 feet (42.7 m.) high, close to it on the east. About 700 yards from its northern side is Sand Clay 6 feet (1.8 m.) in height. It has about 500 inhabitants. (See view 27, Appendix V.)

**Chatham Bay**, on the western side, affords fair anchorage for large vessels in 17 fathoms (31.1 m.) of water, sand; but care should be taken not to go far into the bay, as there is a small shoal, with 6 feet (1.8 m.) of water on it, at about  $\frac{1}{4}$  mile from the shore and a little inside the depth of 10 fathoms (18.3 m.). Small vessels may anchor farther in on the northern side of the bay. There are no dangers in entering the bay, which should be from the northward on the port tack. Give the northwestern point of the island a berth of about 300 yards and pass close to a remarkable small islet, 52 feet (15.8 m.) high, at the north point of the bay, and when abreast it, with good way on, shorten sail and the vessel will shoot into the anchorage.

In Chatham Bay fish can be procured with the seine in great abundance. Firewood is plentiful, but no water. The inhabitants are entirely dependent on what is collected in tanks during the rainy season.

**Frigate Islet**, 250 feet (76.2 m.) high, is connected by a bank and reefs to the southern part of Union Island.

There is a temporary anchorage to the southwestward of Frigate Island in 8 fathoms (14.6 m.). This anchorage should only be used while communicating with the villages on the southeastern side of the island. Small vessels may go closer to Frigate Island, anchoring in 2 or 3 fathoms (3.7 to 5.5 m.).

**Clifton Cove**, at the eastern end of the island, is a secure, smooth anchorage for small vessels, close to the northeastward of a large house. The channel into it is close to the reef which protects the anchorage.

**Prune Island**, about  $\frac{1}{2}$  mile in length and 164 feet (50.0 m.) high, lies 1 mile eastward of Union Island. Nearly midway between

them, or about  $\frac{1}{2}$  mile west of the southwestern end of Prune Island, is a shoal nearly awash, with channels of 4 fathoms (7.3 m.) of water on either side of it that may be taken by small vessels, but are not recommended for general use.

Prune Island is surrounded by reefs, and on the northern side they extend off 800 yards. The navigable channel between the northwestern end of the reefs and those extending from Union Island is less than  $\frac{1}{4}$  mile wide, with from 4 to 13 fathoms (7.3 to 23.8 m.) of water. The route through from the northward is in mid-channel, and westward of the shoal nearly awash of the southwestern end of Prune Island.

**Martinique Channel.**—Between Union Island and reefs and those of Carriacou and Little St. Vincent is a clear channel carrying not less than 7 fathoms (12.8 m.) of water, except on the 5-fathom (9.1 m.) bank off the northwestern end of Carriacou, and which is recommended in preference to the channels between Carriacou and Little Martinique.

**CARRIACOU** ( $12^{\circ} 29' N.$ ,  $61^{\circ} 28' W.$ , *H. O. Chart 1640*) is  $6\frac{3}{4}$  miles in length in a  $45^{\circ}$  and  $225^{\circ}$  direction, and  $2\frac{1}{4}$  miles extreme breadth, with its highest part reaching 980 feet (298.7 m.) above the sea. The eastern and southern sides are more or less bordered by reefs above water, which protect shallow anchorages inside them. The western side of the island is clearer, and the water deeper and there are two good anchorages for large vessels. The island exports a small quantity of sugar and cotton, and carries on a small trade with Grenada and Trinidad, but depends mainly on the former for its own supplies. This and the following islands come under Grenada. There is an island telephone system in Carriacou. (See view 32, Appendix V.)

In 1921, the population was 7,104.

**Tyrell Bay** (Southwest or Great Carenage Bay), at the western end of the island, is an indentation formed by two points, one projecting to the northwestward, the other to the southwestward. The inner part of the bay is circular and more than  $\frac{1}{2}$  mile in diameter.

A reef extends to the northward from the southern side of the bay for nearly 400 yards, and a shoal with  $1\frac{1}{2}$  fathoms (2.7 m.) of water on it lies in the northern part, both within the line of anchorage for large vessels. Small vessels can pass between and above them almost up to the beach.

**Anchorage.**—Large vessels may anchor in the northern and outer part of the bay, in from 15 to 5 fathoms (27.4 to 9.1 m.) of water, sandy bottom, at about 400 yards from the shore; small vessels anchor in the inner part in from 5 to 2 fathoms (9.1 to 3.7 m.).

In the northern part of this bay, inside the lowland, is a lagoon nearly  $\frac{1}{2}$  mile in length, with from 4 to 26 feet (1.2 to 7.9 m.) of water in it. The entrance to it, called Carenage, is through a channel of deep water northward of the  $1\frac{1}{2}$ -fathoms (2.7 m.) shoal in the northern part of the bay.

**Sister Rocks** lie  $\frac{3}{4}$  mile westward of Cistern Point. They are two rocks each about 70 feet (21.3 m.) high and have foul water extending about 200 yards to the southeastward.

**Hillsboro Bay or Grande Anse** ( $12^{\circ} 29' N.$ ,  $61^{\circ} 28' W.$ ).—From Cistern Point, projecting a little northward from the western point of the island, the shore curves to the eastward and northward, forming Hillsboro Bay, on the shore of which stands the little village of that name, and off it is the principal anchorage in Carriacou. Nearly  $\frac{1}{2}$  mile northward of Cistern Point is Mabouya Island, 135 feet (41.1 m.) high, about the same distance eastward of which is Sandy Islet with trees 30 feet (9.1 m.) high. At 1 mile  $53^{\circ}$  from the eastern end of Sandy Islet and the same distance from the village is the small isle of Jack a Dan, 33 feet (10.1 m.) high.

A shoal with 4 feet (1.2 m.) of water on it lies between Jack a Dan and Craigston Point eastward of it, rather nearer the point than the islet, leaving a narrow channel carrying 7 fathoms (12.8 m.) of water between Jack a Dan and the shoal. The passage between the shoal and the shore has 16 feet (4.9 m.) in it.

**Grenadines Light**, fixed white, 200 feet (61.0 m.) above high water, visible 6 miles, is exhibited from a four-legged standard on the veranda of a small house, situated on the hill behind the town. (See Light List.)

**Jetty**.—An iron jetty has been constructed in Hillsboro Bay for the landing and shipment of goods and produce and for the safety of passengers, hitherto exposed at times to much danger from the heavy surf. There are 10 to 12 feet (3.0 to 3.7 m.) of water at the outer end of the jetty. A small black iron cylindrical buoy lies about 100 yards to the northwestward of the jetty.

**Directions**.—The northern point of Carriacou is clear, and may be passed at a distance of 400 yards. For Hillsboro Bay a vessel may pass close to Jack a Dan on its western side, and anchor in 14 fathoms (25.6 m.) of water, sand, and coral, with the isle bearing  $349^{\circ}$ , distant 600 yards, and Sandy Islet on with Sister Rocks. If necessary a vessel may anchor farther to the eastward, but not in less than 7 fathoms (12.8 m.), as from this depth the water suddenly shoals to 2 fathoms (3.7 m.), and the wind sometimes comes from the northwestward, causing a swell. Small vessels can go in almost to the beach. Landing is good, except when interrupted by the northwest swell. Anchorage for large vessels may also be taken in 17 fathoms (31.1 m.), with Jack a Dan bearing  $135^{\circ}$ , distant 1 mile.



A bank  $1\frac{1}{2}$  miles in extent east and west, with 5 to 9 fathoms (9.1 to 16.5 m.) of water on it, lies 1 mile northwestward of the northern part of the island, where vessels may anchor if necessary.

**Watering and Grand Bays**, on the eastern side of Carriacou, are protected by reefs, which are uncovered and skirt the whole of this side of the island at from 700 yards to 1 mile distant. The northern is called Watering Bay, the southern, Grand Bay, off two estates of the same names, and they afford anchorage for small vessels of 9-feet (2.7 m.) draft. There are three channels for entering, but that between the reefs at the northern end, northward of the dry sand bank, is the safest. The two southern channels, although deep breaks in the reef, are difficult to enter without local knowledge.

**Little Martinique** ( $12^{\circ} 31' N.$ ,  $61^{\circ} 23' W.$ ), 745 feet (227.1 m.) high, lies about 3 miles eastward of the northern point of Carriacou, and 700 yards north of it is Little St. Vincent, 275 feet (83.8 m.) high. Off the southwestern side of Little Martinique are the islets of Little Tobago and Fota, the former 202 (61.6 m.) and the latter 80 feet (24.4 m.) high. On the northern side of Little St. Vincent are two sand banks 3 feet (0.9 m.) above water, about 1,500 yards distant; from the easternmost a reef, uncovered, sweeps round the whole eastern side of the island. At 400 yards  $211^{\circ}$  from Little Tobago is a rock, with  $1\frac{1}{2}$  fathoms (2.7 m.) of water on it, and  $201^{\circ}$  about 1,500 yards from the western sand bank are some shoal patches, with 2 fathoms (3.7 m.) over them. (See view 32, Appendix V.)

The channel between the Carriacou Reefs and the islet of Little Tobago is 800 yards wide. In using it from the southeast keep one-third the breadth of the channel from the edge of the reef, and when Fota is open of the northwestern part of Little Tobago a vessel will be to the westward of the  $1\frac{1}{2}$ -fathom (2.7 m.) rock. Between the rock and the reef there is from 6 to 10 fathoms (11.0 to 18.3 m.) of water, but the tides in this channel are very strong and it is not recommended.

**Fota Channel**, or that between Little Tobago and Fota, although narrow, is better than the former. A small reef a little above water extends rather more than 50 yards northward from Little Tobago.

Between Fota and Little Martinique is a passage carrying  $3\frac{1}{2}$  fathoms (6.4 m.) of water, but it is not so good as the Fota Channel.

**Caution.**—As the tidal current sets with a velocity of 3 knots through the above channels, it is necessary in working through from the northwestward that the tide should be setting to the southeastward, and in standing to the southward do not approach too near the Carriacou Reefs.

**Anchorage.**—At about  $\frac{1}{2}$  mile off the northwestern side of Little Martinique, protected by Little St. Vincent, the sand banks and

reefs surrounding these islands, there is excellent anchorage in from 8 to 12 fathoms (14.6 to 21.9 m.) of water, taking care to avoid the 2-fathom (3.7 m.) shoals about 1,500 yards  $201^{\circ}$  from the west sand bank.

**Tides.**—It is high water, full and change, at Carriacou at 3h. 00m. The rise and fall seldom exceeds 1 foot (0.3 m.), and often it is only a few inches; an extraordinary high tide may, however, rise 2 feet (0.6 m.).

**Large and Frigate Islets** ( $12^{\circ} 25' N.$ ,  $61^{\circ} 29' W.$ ; *H. O. Chart 1640*) are the largest of a number of islets and rocks, which, with Saline, White, Mushroom, Rose, and Bonaparte form a group at the southern end of Carriacou Island. Between the Bonaparte Rocks there is a narrow channel 9 fathoms (16.5 m.) deep, but a rock almost dry lies a little to the northward of the fairway, which renders it unfit to pass through.

In the channel between Large Islet and Bonaparte Rocks, southward of it, is a shoal stretching to the northward from the latter, and one with 3 fathoms (5.5 m.) of water on it at  $\frac{1}{2}$  mile northwestward of the rocks, and nearly the same distance southwestward of the western end of Large Islet. The current runs with great strength, which renders it dangerous to use this channel or to approach the rocks on the eastern side, unless in cases of extreme necessity. A rock 1 foot (0.3 m.) out of water lies 250 yards westward of Large Islet.

**Anchorage.**—There is anchorage for small vessels close under the western side of Frigate Islet, and large vessels will find temporary anchorage to the southwestward of the islet.

**Frigate Channel**, between Large and Frigate Islets, is narrow, but clear of danger, and may be used by passing to the southward of Rose Rock, 32 feet (9.8 m.) high. There is also a channel carrying 5 fathoms (9.1 m.) of water between Rose Rock and Frigate Islet.

**Saline Channels.**—The channel between Frigate and Saline Islets, 1,400 yards wide, carries about 18 fathoms (32.9 m.) of water. A rock 1 foot (0.3 m.) above water lies northwestward 400 yards from the northwestern point of Frigate Islet. There is also a narrow channel with 4 fathoms (7.3 m.) of water in it northward of Saline Islet, between it and Cassada Rocks, 20 feet (6.1 m.) high and White Islet. Also a channel 8 to 11 fathoms (14.6 to 20.1 m.) deep on the northern side of Cassada Rocks and White Islet and the reef adjoining them. In using this latter channel pass about  $\frac{1}{2}$  mile westward of White Islet and southward of Mushroom Islet. The latter may be passed close-to on the southern side.

There is a narrow passage to the northward between Mushroom Islet and Little Mushroom, but rocks above water lie off the southwestern point of Carriacou, at a distance of 300 yards.

The above channels can be taken only from east to west, with the usual trade winds, except by steamers. Small vessels having local knowledge, with the assistance of the tidal current, may work through them.

**Currents.**—The flood tide sets through these channels from east to west with a velocity of 3 knots. The ebb tide sets in the opposite direction with a velocity of 2 knots.

**Anchorage** for small vessels in 5 fathoms (9.1 m.) of water will be found in the northwest bay of Large Islet, 200 yards from the shore; also on the northwestern side of Frigate Islet. Between Saline Islet and Cassada Rocks and the reef, there is good shelter for small vessels, taking care not to be set to leeward on White Islet.

**Caille and Ronde Islets** ( $12^{\circ} 18' N.$ ,  $61^{\circ} 38' W.$ ; *H. O. Chart 1316*).—Off the northeastern end of Grenada is Caille Islet, 242 feet (73.8 m.) high, and close to the northward of it Ronde Islet, 513 feet (156.4 m.) high. There is a narrow channel between them having 3 to 5 fathoms (5.5 to 9.1 m.) of water, but which breaks during strong winds. There are passages to The Sisters to the westward, and also between them and Rhode Islet. (See view 29, Appendix V.)

**The Sisters** are two groups of islets or rocks, 160 and 85 feet (48.8 and 25.9 m.) high, at about  $\frac{1}{2}$  and nearly 1 mile, respectively, west of the southwestern end of Ronde Islet.

Between Ronde and Diamond (Kick'em Jenny) Islets, 668 feet (203.6 m.) high, is a passage less than  $\frac{1}{2}$  mile wide, carrying 6 fathoms (11.0 m.) least water. In the center of the channel there is a deep hole, with 39 fathoms (71.3 m.) of water in it. The tide runs strongly through this channel.

**Les Tantes**, 250 feet (76.2 m.) high, lie  $1\frac{3}{4}$  miles eastward of the northern part of Ronde Islet, free from hidden danger, and may be passed close-to on either side. The channel between them and Ronde Islet is deep and clear, but the tide being strong, 3 knots at times, it is not recommended.

**Anchorage.**—With the usual trade wind, a small vessel will find convenient depths for anchoring under the lee of Caille Islet, in the south and northwestern bays of Ronde Islet, and on the western side of Les Tantes.

**London Bridge.**—These rocks form a small cluster, one of them being 75 feet (22.9 m.) high, with a hole through it, and having two smaller ones near it. There is a rock just uncovered lying 400 yards

southwestward of it. They are about  $1\frac{1}{2}$  miles  $203^{\circ}$  from Caille Islet.

**GRENADA** ( $12^{\circ} 07' N.$ ,  $61^{\circ} 41' W.$ , *H. O. Chart 1316*) was first settled by the French in 1650 and has been since 1783 an English colony. It is about 21 miles in length and 12 miles across and contains about 120 square miles.

In 1921, the population by census was 59,198.

**Aspect.**—The land is of volcanic origin and is traversed by a chain of mountains of irregular height.

The appearance of the island is that of a gradual rise of hills from the shore to the mountains in the center, resembling in its principal features other of the volcanic islands of the West Indies, but dissimilar to those of calcareous formation, such as Barbados, Bermuda, or the Bahamas. There are three lakes, or rather large ponds, in the island, formed as basins, having all the appearance of extinct craters. That of Grand Etang, 7 miles from St. George and 1,759 feet (536.1 m.) above the sea, is 13 acres in extent,  $2\frac{1}{2}$  fathoms (4.6 m.) deep, and the source of the Great River, the largest in the island.

Grenada is a well-watered country. Every valley has a stream and the larger ones are never dry. During rainy weather they sometimes become impassable, and at various times accidents have occurred to persons trying to cross them. Nearly all the beds of the rivers are full of large, slippery boulders of water-worn trap rock, with deep holes between them, and the beaches where the streams run into the sea are generally soft. Horses occasionally get deep into these quicksands. These streams are almost all used as the principal motive power for making sugar.

**Climate.**—The island has the reputation of possessing a healthful climate, but it does not appear to have any advantage in this respect over the other West Indies. Fevers are often prevalent in all stages, from slightly bilious to yellow fever. Deaths from the latter are by no means infrequent, and even persons who have been some time in the island are not exempt from them.

The average quantity of rain falling per annum is 70 inches. No long-continuous rain seems to occur, but showers constantly, and at times every five minutes, with bright sunshine between.

During July, August, and September the temperature in the low grounds is from  $85^{\circ}$  to  $90^{\circ}$ . From December to March it is a little cooler, and at night the thermometer is sometimes down to  $72^{\circ}$  and not above  $80^{\circ}$  in the day. The maximum temperature in the low grounds for five years was  $89^{\circ}$ , the minimum  $77^{\circ}$ , and the mean  $83^{\circ}$ . The hottest season is from June to October, when the thermometer ranges from  $77^{\circ}$  to  $88^{\circ}$ . (See Meteorological Table, Appendix IV.)

**Winds.**—The trade wind varies from northeast to southeast, and there is no land wind. Gales are of rare occurrence at Grenada, but the strong trade winds, almost approaching them in strength, sometimes blow for weeks, detaining the coasting vessels in port. Occasionally, when the trade wind falls, calms and light airs from the westward will be felt on the lee side of the island. The island is nearly free from hurricanes, only two having occurred since the year 1760, viz, August 12, 1768, and October 10 and 11, 1780, and were not then particularly violent.

**Current and tides.**—Between Grenada and Trinidad the westerly current may be especially strong, ranging from 24 to 72 miles a day, when the trade wind is at its height. Very strong currents have been met with to the eastward of the islands from Grenada to Guadeloupe.

Off the bank southward of Grenada, the current generally sets 2 knots to the westward. On the bank it is checked by the ebb tidal current, which sets around the southwestern point of the island and along the southern shore, but which is only felt for 2 or 3 hours, while the flood tidal current, increased by the prevailing current, runs for 8 and 9 hours to the westward. Off Great Bacolet, on the southeastern side of the island, where the ebb scarcely reaches, the current united to the flood tidal current runs down strong for 6 hours and weak for 2 hours, while the ebb tidal current overcomes the normal current for 4 hours.

The current striking Grenada on its eastern face turns along the shore both to the southwest and the northwest, and at some points is not overcome by the tidal current.

During the wet season (from June to the fall of the year) the ebb is often entirely overcome by the current, probably caused by the water discharged from the South American rivers. Therefore a sailing vessel from St. George to Grenville Bay should go round the northern end of the island, as it is scarcely possible to work past Great Bacolet Bay. Very little tide or current is felt under the lee of Grenada, and, if any, it is quite uncertain, except close along shore, where it is also weak. The water in the southern harbors is unaffected by the tide.

The following rule is used by the island seamen for determining the time of the turn of the current: From the time of the moon's rising until her upper transit of the meridian, the stream sets to the eastward; from the upper transit until she sets, it runs westward; then from the time of the moon's setting until her lower transit, the stream runs to the eastward again; from the lower transit until she rises, it runs to the westward. The ebb current, however, has been found to set eastward or to windward later by  $1\frac{1}{2}$  or 2 hours, although at particular points close inshore the above rule is nearly correct. This also applies to the Grenadines.

**Soundings.**—Grenada is surrounded by a coral bank on which are the Grenadines, and which extends to the southwestward of the island a considerable distance. The 100-fathom (182.9 m.) curve in this direction lies with Point Saline bearing  $49^{\circ}$ , distant 21 miles. From this edge, which is somewhat rounded and about 2 miles broad, the bank having general depths of 15 to 20 fathoms (27.4 to 36.6 m.), increases in width and joins the 100-fathom (182.9 m.) curve on either side of the island.

The 100-fathom (182.9 m.) curve is at a distance of from  $2\frac{1}{2}$  to 7 miles from the eastern coast of the island and from the islets to the northward of it; the bank has about 27 fathoms (49.4 m.) near the edge, decreasing to about 20 fathoms (36.6 m.) at  $\frac{1}{2}$  to 1 mile from the shore. The western edge of the bank is much nearer, averaging only 1,300 yards from the island.

It will be seen on looking at the chart that there is but a narrow channel of deep water from all the southern harbors armlets of Grenada to the clear bank outside, and that banks on which there are less than 5 fathoms (9.1 m.) of water extend off the adjacent points; this being the general feature of all, the difficulty of taking vessels into them increases, as in almost all cases, from the wooded appearance of the island, no natural leading marks can be given, and as the courses in are principally circuitous it will be necessary for the utmost caution to be used in navigating them.

**Reindeer Shoal** ( $11^{\circ} 57' N.$ ,  $61^{\circ} 59' W.$ ; *H. O. Chart 1316*).—At the distance of 11 miles  $253^{\circ}$  from Saline Point Lighthouse is Reindeer Shoal, having  $4\frac{3}{4}$  fathoms (8.7 m.) least water. It is about  $3\frac{1}{2}$  miles in extent, the shoalest part being in the position mentioned.

**ST. GEORGE HARBOR** ( $12^{\circ} 03' N.$ ,  $61^{\circ} 46' W.$ ; *plan on H. O. Chart 1316*), protected on the north by St. George, is located about 4 miles from the southwestern point of Grenada.

The harbor consists of three basins; the southern is called the lagoon. It and the middle are of no value except to small craft. The northern one, called the carenage, forms the harbor proper.

A ground swell sets in here from the month of November to March, sometimes causing a swell in the carenage. This ground swell takes place in the same month throughout all the islands.

**Depths.**—The length of the harbor is about 900 yards, and its breadth varies, but from the western shore to the shoals on the eastern side it is less than 350 yards across, which diminishes at the head to 200 yards. On the southeastern side is a large indentation with shallow water, the southern part of which, separated from the northern by a point of land, is somewhat circular, about 500 yards

in diameter, and in the center from 20 to 25 feet (6.1 to 7.6 m.) deep; this latter part is called the lagoon.

Although small, the harbor is secure, and could be entered by vessels of deep draft through a channel carrying from 5 to 11 fathoms (9.1 to 20.1 m.) of water to the anchorage. The harbor master acts as pilot. The usual anchorage for naval vessels is in the bay.

The 100-fathom (182.9 m.) curve westward of Fort George Point is only  $1\frac{1}{4}$  miles from it, and the bank off the town is intersected by channels of deep water. It affords, however, excellent anchoring ground, but it is necessary to guard against the inconvenience of anchoring in the deep-water holes.

**Aspect.**—The locality of the harbor or carenage may be easily known by the extensive fortified heights immediately above it, which reach 750 feet (228.6 m.) above the sea. The northern point of entrance, on which is Fort George with the town northward of it, is a bold headland. (See view 19, Appendix V.)

**Signal station.**—There is a signal station at Fort George.

**St. George Harbor Light**, fixed red, 192 feet (58.2 m.) above high water, visible 7 miles, is exhibited from a brick structure 10 feet (3.0 m.) high on Fort George. (See Light List.)

**Dangers—Shoals.**—From the southern point of entrance to the harbor a bank about 700 yards in breadth, with an average depth of 4 fathoms (7.3 m.) on it, extends westward for about 1,500 yards. There are, however, shoaler patches on it with 15 and 20 feet (4.6 and 6.1 m.) of water over them.

A 3 fathom (5.5 m.) patch is located 450 yards,  $300^{\circ}$  from St. George Light.

**Buoy.**—A white cask buoy with white cone is moored on its southwestern edge.

**Annas Shoal** is located 1,100 yards  $255^{\circ}$  from the St. George Light. It is about 150 yards in length and 25 yards wide and has a least depth of  $3\frac{1}{4}$  fathoms (5.9 m.)

**Buoy.**—A black can buoy surmounted by a white cone marks the northern side of Annas Shoal.

**Three-fathom Banks** are from 200 to 400 yards south of the Annas, and 400 yards southeastward of them are other patches, having from 16 to 20 feet (4.9 to 6.1 m.) of water on them. There is a 3-fathom (5.5 m.) patch 200 yards,  $234^{\circ}$  from Fort George Point.

The right extremity of Fort George Point, in range with the Governor's House  $60^{\circ}$ , leads nearly 200 yards to the southeastward of them in 4 fathoms (7.3 m.) of water.

**Harbor entrance buoys.**—A black conical buoy surmounted by a white globe is moored in 5 fathoms (9.1 m.) of water 780 yards  $248^{\circ}$  from St. George Light. This buoy and the buoy to northward of Annas Shoal should be left on the starboard hand in entering.

A buoy, painted in red and white vertical stripes, is moored in 5 fathoms (9.1 m.) of water, 585 yards 237° from St. George Light-house.

A buoy, painted in red and white vertical stripes, is moored in 5 fathoms (9.1 m.) 400 yards, 192° from St. George Light.

Both the above two buoys should be left on the port hand in entering.

The 3-fathom (5.5 m.) edge of the bank on the southern side of the channel is marked by a spherical buoy, painted red and white in vertical stripes. This buoy should be left on the starboard hand in entering.

**Beacon.**—A white pole beacon with conical top mark indicates the position of a rock awash close southward of the public works shed wharf.

Within the entrance on the southern side of the carenage is a white spar buoy surmounted by a white triangular top mark. This buoy marks the entrance to the lagoon.

**Anchorage.**—There is anchorage for vessels of moderate length abreast Fort George in 11 fathoms (20.1 m.) and in the carenage in from 5 to 10 fathoms (9.1 to 18.3 m.), under the direction of the harbor master. If intending to make any stay, it will be advantageous to moor, as there is but little room to swing at single anchor.

**Outer anchorage.**—The best anchorage outside St. George Harbor for a ship of large draft is in 7 fathoms (12.8 m.), sandy bottom, with Fort George flagstaff in range with the southern end of the high wall of Fort Frederick, the highest of the forts on Richmond Hill, bearing about 94°, 800 yards from the flagstaff. A 3-fathom (5.5 m.) shoal, lying about 300 yards offshore in the outer anchorage, is marked by a white cask buoy surmounted by a white cone, moored southwestward of it. Small vessels may anchor farther inshore and also in the Bay of Grand Ance and Martin Bay, farther southward.

**Tides.**—The high-water interval at St. George Harbor is 2h. 30m.; mean range of tide 1.2 feet (0.4 m.) spring range 1.5 feet (0.5 m.). An extraordinary high tide may rise 2¼ feet (0.8 m.).

**Pilotage.**—Pilotage is not compulsory but is advisable if proceeding into the carenage.

The signal for a pilot is the pilot flag at the fore during daylight and a blue light accompanied by blowing of the whistle at night.

The pilot boat, which is usually a rowboat, shows the same signals as does a vessel desiring a pilot.

If arrangements are previously made, pilots will take ships of not more than 1,500 tons into the carenage at night.

**Directions.**—Vessels from the eastward or southward should give the southern side of the island a berth of about 2 miles to avoid the



Porpoises and other dangers, and from abreast Saline Point, Mount Moritz, open westward of St. Eloy Point bearing eastward of 39° (see view 19, Appendix V), leads westward of the shoal off Saline Point and off Long Point Shoal, and to abreast the deep-water entrance of St. George Harbor. Steer in with the southern extremity of Fort George Point in range with the southern end of the prison, a large building on the first ridge inland, 98°. This mark will lead in nearly 200 yards northward of the northern 20-foot (6.1 m.) patch of Annas Shoal. When the square tower with four pinnacles of the Scottish Church is in range with the plain white stone tower of the Episcopal Church 67°, haul to the southeastward in good time for the southern end of the sand in Martins Bay in range with a peak having two trees on its summit 143°, until the northern extremity of the Ballast Cliff bears 91°; steer on this line for a distance of about 350 yards, or until the western tangent of Fort George Point bears 340°, then up the harbor with the Governor's House bearing 53°, anchoring as convenient.

Vessels of moderate draft—and none above that are recommended to use the harbor—coming from the southward can proceed in southeastward of Annas Shoals apparently in not less than 26 feet (7.9 m.) with Government House in range with the eastern extremity of Fort George Point bearing 59°, until the northern extremity of Ballast Cliff bears 91°, thence as before directed.

Sailing vessels from the southward whose draft will admit of crossing Annas Shoal should make a tack into Bay of Grand Ance, to take advantage of the flaws of wind which occasionally come from the southeastward, and which enable them to lay well up for the carenage.

**ST. GEORGE** (*12° 03' N., 61° 46' W.; H. O. Chart 1316*) is the principal city of Grenada and the capital of the Windward Islands. The town stands on a point of land ranging from 115 to 180 feet (35.1 to 54.9 m.) high.

The population of the town is about 5,000.

The United States is represented by a consular agent.

**Wharves.**—There is a wharf in the carenage with depths of 18 to 20 feet (5.5 to 6.1) alongside available for ships of not over 1,500 tons net tonnage.

On the wharf there are two cranes, one of 7 tons capacity and the other of 2½ tons.

Steamers usually moor in the inner harbor and cargo is handled by means of open lighters. Ship facilities are used for unloading.

**Fuel.**—There is neither coal nor fuel oil available.

**Supplies.**—Commissary provisions can be obtained in limited quantities. Fresh fruits are available when in season. Small articles of engineering stores might be obtained in case of necessity.

**Fresh water** can be obtained when in the inner harbor by means of hose led over the wharf. The water is supplied by the St. George District Board.

**Communication.**—Small steamers of the Royal Mail Steam Packet Co. make trips around the islands, calling at various places.

The steamers of the Furness Withy Steamship Co. also call here.

A telegraph cable is laid to St. Lucia and thence to St. Croix (Santa Cruz). A cable is also laid between Grenada and Trinidad. The West India & Panama Telegraph Co. owns the cable lines. There are no inland telegraphs, but there are 159 miles of trunk telephone lines.

**Radio.**—A radio station, open to the public, call letters G Z G, is located at St. George Harbor. (See International Radio List).

The sanitary condition of the town is considered good.

**Hospital.**—The Colony Hospital, Government owned, situated at St. George, has about 60 beds. It is recommended for seamen of visiting ships.

**Quarantine.**—The quarantine flag should be hoisted until pratique is granted. Bills of health are required and issued by the port health officer.

**Long Point** ( $12^{\circ} 01' N.$ ,  $61^{\circ} 47' W.$ ; *H. O. Chart 1316*).—Two miles southwestward of St. George Harbor Light is Long Point, to the northward of which is an indentation in the coast called Bay of Grand Ance.

**Long Point Shoal** is 900 yards west of Long Point, having only 2 feet (0.6 m.) of water on it, and on which the sea generally breaks.

**Directions for clearing.**—In approaching St. George Harbor from the southward, the eastern extremity of Fort George Point kept on with Government House, a large red brick building on the first ridge, bearing  $60^{\circ}$ , will lead clear, 500 yards to northwestward of the shoal. Government House can be distinguished by its long flag-staff flying the Union Jack, which is very conspicuous above the trees surrounding the building. Long Point Shoal itself can be easily seen with the sun behind the observer. Or St. Eloy Point, in range with Mount Moritz, the first high hill back from Boismorice Point, bearing  $38^{\circ}$ , leads westward of the shoal, and up to entrance of St. George Harbor. (See View—Appendix V.) There is a narrow channel between Long Point and the shoal, but it should only be used in case of necessity.

**Anchorage.**—There is good anchorage in 4 or 6 fathoms (7.3 or 11.0 m.) of water on the bank extending southwestward from Long Point Shoal, at rather more than a mile northeastward of Saline Point and about  $\frac{1}{2}$  mile from the shore. There is a hole 10 to 13 fathoms (18.3 to 23.8 m.) deep nearer the shore, about 1,500 yards in extent.

**SOUTH COAST—Saline Point**, so called from a salt pond near it, is bold, perpendicular, and 100 feet (30.5 m.) high. It should not be approached in a large vessel nearer than 1 mile, to avoid the Seringapatam Shoal and the bank joining Saline Point and Glover Island.

**Saline Point Light** (see view 14, Appendix V), fixed white, 120 feet (36.6 m.) above high water, visible 12 miles, is exhibited on an iron column 28 feet (8.5 m.) high, erected on Saline Point. (See Light List.)

**Seringapatam Shoal**, with  $3\frac{1}{2}$  fathoms (6.4 m.) of water on it, lies 700 yards  $229^{\circ}$  from Saline Point Light. This shoal is about 300 yards in extent, with 4 and 7 fathoms (7.3 and 12.8 m.) of water around it. The sea over it is always in a disturbed state. Vessels

of light draft may pass Saline Point at the distance of 200 yards, but others should pass outside, not turning to the northward until Mount Moritz bears  $38^{\circ}$ .

**Glover Island.**—At  $1\frac{1}{4}$  miles  $136^{\circ}$  from Saline Point, and 1,250 yards from the shore, is Glover Island, 41 feet (12.5 m.) high, which at a distance appears like a sail. Connecting Glover Island to Grenada is a shoal with a least depth of  $1\frac{1}{4}$  fathoms (2.3 m.). There is a very conspicuous single thin tree on Glover Island, which to a vessel approaching from the southeastward can be mistaken for Saline Point Lighthouse. Small vessels find convenient anchorage under its lee in waiting for tide when working to windward along the southern shore.

A whaling station has been established on Glover Island, the whaling season being from January until May. During this period electric lights used in the operations may be visible at nighttime from seaward.

**The Porpoises** ( $11^{\circ} 59' N.$ ,  $61^{\circ} 46' W.$ ; *plan on H. O. Chart 1316*) are a cluster of rocks about 200 yards in extent, 3 feet (0.9 m.) above water, steep-to, and lying  $1\frac{3}{4}$  miles  $108^{\circ}$  from the southern end of Glover Island and 250 yards within the 10-fathom (18.3 m.) curve. About 700 yards beyond them, on the same bearing, is a shoal spot with  $3\frac{1}{2}$  fathoms (6.4 m.) of water on it.

**Prickly Bay** (*H. O. Chart 1316*) lies to the westward of Prickly Point, the most southern of Grenada; it is easy of access and affords good temporary anchorage for vessels of 18 feet (5.5 m.) draft. There is a shoal with  $1\frac{1}{2}$  fathoms (2.7 m.) of water on it at about  $\frac{1}{4}$  mile from the head of the bay which can not be distinctly seen. To the westward are True Blue and Hardy Bays, which may be used by vessels of 15 feet (4.6 m.) draft.

**Directions.**—A vessel from the eastward should steer  $\frac{1}{4}$  mile to the southward of The Porpoises, and haul up for Prickly Point, passing it at a distance of 200 to 300 yards, over a bar of 4 fathoms (7.3 m.) of water, and anchor where convenient in 6 to 8 fathoms (11.0 to 14.6 m.), keeping southward of the shoal at the head of the bay. A little to the westward of the track in, abreast Prickly Point, there is some shoal ground with 16 feet (4.9 m.) over it.

**Mount Hardman Bay** (*plan on H. O. Chart 1316*) just eastward of Prickly Bay is also a safe anchorage in 4 or 5 fathoms (7.3 or 9.1 m.) of water, but the channel to it is tortuous. It may, however, be used by small vessels by keeping the left hill of Hog Island bearing about north until at a distance of  $\frac{1}{2}$  mile from the shore; then make good about  $313^{\circ}$  for Mount Hardman Point, and through the reefs by the eye, the water being smooth. The eye is the only guide.

**Clarkes Court Bay.**—The entrance is formed by Caliveny and Hog Islands, and the shoals and reefs extending from them. It is capable of holding a large number of vessels, and would present no difficulty in entering under steam were the shallows buoyed. The anchorage ground is about  $\frac{3}{4}$  mile in length and 600 yards wide, in 7 and 8 fathoms (12.8 and 14.6 m.) of water, muddy bottom. The passage is through a narrow channel of deep water, between the banks on either side, with 2 to 4 fathoms (3.7 to 7.3 m.) on them. Here vessels may lie quite secure, even in a hurricane. There are three shoals in the bay, one in the northeastern and one in southwestern part, both nearly dry, and one with 6 feet (1.8 m.) of water over it in the northern part.

**Directions.**—Being to the southeastward of Caliveny Island, continue on cautiously on a westerly course until the right (162 feet (49.4 m.)) peak of Hog Island bears  $325^{\circ}$ , then head for it on this course observing care not to get to the right of the range, the two eastern points of Hog Island in line bearing  $330^{\circ}$ . When the Fort Jeudy Point is shut out by the southern point of Caliveny Island alter course to the right to head for mid-channel to anchorage. A course made good of  $348^{\circ}$  will accomplish this. Anchor at discretion after the northern point of Caliveny Island is abeam.

**Anchorage.**—There is good anchorage for small vessels between Hog Island and the mainland in 4 fathoms (7.3 m.) of water; the channel is narrow, but may be taken in fine weather.

**Port Egmont** is an inlet carrying 8 fathoms (14.6 m.) of water to the upper part, where there is a narrow passage to an inner harbor, landlocked, 4 and  $5\frac{1}{2}$  fathoms (7.3 and 10.1 m.) deep, with  $3\frac{1}{2}$  fathoms (6.4 m.) of water at the entrance, and where vessels may lie hidden from seaward. Fort Jeudy Point 70 feet (21.3 m.) high to the westward stretches well to the southward, and has a detached rock off it.

There is secure anchorage for small vessels on the western side of Adam Islet, southward of Point Egmont, which forms the western side of entrance to the port, but it is difficult for a sailing vessel to get to sea, the course out being about  $135^{\circ}$ .

**Directions.**—Bring the eastern extremity of Gary Islet, northward of Adam Islet, on with the extreme point of the western side of the harbor and a hill to the northward of it bearing about  $341^{\circ}$ , which will lead to the entrance of the harbor; when the land to the eastward of Fort Jeudy Point is shut in steer more to the northward, skirting the western bank, and should the wind be as far to the northward as northeast, be prepared to anchor quickly when the flaws take the vessel, and then warp in. There is no room to work in or out of

this harbor, but a vessel will be able to sail in with the wind to the southward of east, or out with the wind to the northward of it.

**Caliveny Harbor** is a small basin extending east and west about  $\frac{1}{2}$  mile in extent, being the inlet next eastward of Port Egmont. The entrance will be known by Westerhall Point trending to the eastward, with light-colored cliffs on the southeastern side, and having three separated hills on it.

**Directions.**—Having made out the entrance of the harbor, steer  $316^{\circ}$  midway between the shallows at the southern extremity of Westerhall Point and those from the eastern part of Fort Jeudy Point. When abeam of Westerhall Point, alter course to head through deep water until within the basin; then anchor in the eastern part in  $3\frac{1}{2}$  to 4 fathoms (6.4 to 7.3 m.). It will be necessary to warp out, unless the wind should be from the northward.

**Bacaye Harbor** lies within the projecting point of Westerhall and affords excellent anchorage for small vessels in 4 fathoms (7.3 m.) of water. It is, however, necessary to warp out in fine weather as far to windward as the northeastern bank of Little Bacaye, so as to weather the rocks off Westerhall Point. Little Bacaye has a hole of deep water with a sheltering reef.

**St. Davids Harbor** ( $12^{\circ} 01' N.$ ,  $61^{\circ} 41' W.$ ; *H. O. Chart 1316*) is the most important on the southern coast in coming from the eastward. The entrance is formed by St. Davids Point and the reef extending from Middle Point immediately westward of it; from the latter a dangerous ledge extends to the southward beyond St. Davids Point. The harbor is capable of affording accommodations for vessels of moderate draft, and temporary anchorage will also be found in Little Bacolet Bay to the westward of the reef; the latter is easier of access.

**Water** may be obtained here from the river of Little Bacolet, which empties close to the anchorage.

**Directions.**—Mount Sinai, the high southern mountain, 2,300 feet (701.0 m.) in height, bearing  $340^{\circ}$ , will be in range with the square cliff point of St. David, which with Little Bacolet Point forms a larger indentation than the bays to windward of it. In entering the harbor steer midway between St. David Point, which is foul, and the reef extending from Middle Point. In a sailing vessel keep sufficiently near the weather shore and be in readiness to anchor should the flaws of wind come too much from the northward, then warp in and anchor eastward of Middle Point in  $5\frac{1}{2}$  fathoms (10.1 m.) of water. In leaving, it will be necessary to have the wind to the northward of east and to close with the weather shore before standing out of the harbor.

**Southeast coast.**—From St. Davids Point to Grenville Bay the eastern coast of Grenada is indented with numerous small bays, only frequented by coasters for the collection of produce. The bays are all more or less open to wind and sea.

**Great Bacolet Point** is 5 miles northeastward from St. Davids Harbor and forms the southern side of St. Andrew Bay.

**St. Andrew Bay** is between Great Bacolet Point on the south and Marquis Island on the north. The mark for going in between the shoals on either side is the western extremity of Marquis Island on with the north of two houses or stores on Grenville Bay Beach 323°. Anchor midway between the reefs with the western end of the island bearing 0°. It is difficult to get out of this bay, and it is hardly fit for any vessel but a drogher.

**Grenville Bay** and village, between Marquis Island and Telescope Point, 1½ miles apart, is the second place of importance in the island, and vessels of 400 tons load here at moorings. The bay is encumbered with reefs, and there is much difficulty and danger in entering, and sometimes a protracted delay in leaving it. Vessels lie sheltered by the end of an outer reef until lightened to 12 feet (3.7 m.) draft, and in the same place while loading above it. Within the inner reef it is smooth and safe for vessels of 10 feet (3.0 m.) draft, but it is necessary to warp out through the channel between the reefs for about ½ mile to sea, which requires the finest weather, with the wind well to the northward, but droghers of 30 tons can work out.

**Pilots.**—There are no distinct marks for entering this bay, and it should not be attempted without the aid of a pilot.

**Caution.**—In coming in from seaward for Grenville Bay it will be necessary to guard against being set to leeward by the current. Here it runs so strongly to the southwestward that a vessel missing the bay will have to go round the island and again come in from the northeastward. The stream, striking Grenada on its eastern face, turns alongshore both to the northwest and southwest, and at this point is not overcome by the tide.

**The east coast** from Grenville Bay to Bedford Point runs nearly north for 6 miles. It is an open sandy shore, with shallows off it, exposed to the whole force of the trade wind, and on which and, in strong breezes, everywhere within the 5-fathom (9.1 m.) line of soundings the sea breaks, as it does generally on the whole of the eastern and southern coasts.

**Islands.**—Off this part of the coast are the following islands:

Telescope Rock, 65 feet (19.8 m.) high, 1,000 yards eastward of Telescope Point.

Conference Island, 62 feet (18.9 m.) high, about  $1\frac{3}{4}$  miles northward of Telescope Rock.

Antony Rock, 33 feet (10.1 m.) high, about  $1\frac{1}{2}$  miles north-northeastward of Conference Island.

Bird Island, 50 feet (15.2 m.) high, about 3 miles northeastward of Antony Rock.

**A shoal** with 3 fathoms (5.5 m.) lies  $2\frac{3}{4}$  miles northward of Antony Rock.

**Sandy and Green Islands** ( $12^{\circ} 13' N.$ ,  $61^{\circ} 36' W.$ ; *plan on H. O. Chart 1316*).—Anchorages under their lee are safe and accessible, and vessels might load from the shipping point at Levera, but, as the lee tide sets strong round Bedford Point and the trade wind tends to increase it, there would be considerable delay in loading vessels at either of these anchorages. Sandy Island is surrounded by a reef which extends southward about  $\frac{1}{4}$  mile. The southern side of Green Island is also foul 200 yards off.

**Irvins Bay** (*H. O. Chart 1316*) is the principal anchorage on the northern side of Grenada, where about one-half of the annual crop of the island is shipped. Vessels generally moor on a 7-fathom (12.8 m.) bank extending from the shore with open hawse to the northeastward. It is recommended to drop the outer anchor with the southern end of the island of Levera in range with the northern extremity of Grenada (see view 20, Appendix V), and to place the starboard or inshore anchor to the southeastward, with about 70 fathoms of chain on the outer and 30 fathoms on the inner anchor. The ship will then be about 800 yards from the shore. This anchorage is exposed, and the wind occasionally blows hard from north-northeast. It is not, however, dangerous in the spring of the year, the holding ground being good. Droghers and small vessels may take shelter in Levera Bay, under the lee of the island of the same name.

**Sauteurs Bay**.—To the eastward of David Point, the northwestern extremity of Grenada, is Laurant Point. Shallow water extends off about  $\frac{1}{4}$  mile from both points. One mile southeastward from the latter is the village of Sauteurs, on a bay of the same name. Some rocks extend to the northwestward from the point forming the eastern side of the bay, which shelters small boats only. The extremity of the point is a high, perpendicular cliff, called *Le Morne des Sauteurs*, or the Hill of the Leapers.

**West coast**.—Between David Point, the northern extremity of the island, and St. George Harbor, the following bays abreast of the villages of the same name affords temporary anchorage for coasters, viz:

Duquesne, Grayfish, St. Marks, Goyave, Halifax, and Grand Mal Bays. There is also anchorage on the 5-fathom (9.1 m.) bank  $1\frac{1}{2}$

miles northward of Boismorice Point. All these bays are exposed to the northward and westward and are very subject to strong gusts off the land.

**St. Marks.**—The anchorage in the bay of St. Marks, off the village of that name, 3 miles from David Point, is exposed to the north winds, but, as they seldom blow strong, vessels often anchor here in 10 or 11 fathoms (18.3 to 20.1 m.) of water, about 450 yards from shore.

**Goyave** is 2 miles southwestward from St. Marks. There is anchorage southwestward of the village 400 yards from shore, in 7 fathoms (12.8 m.) of water.

A substantial pier extends off the village of Goyave about 150 yards. It has been reported that this pier is partially destroyed. Two small steamers belonging to the Royal Mail Steam Packet Co. go alongside on their trips round the island.

**Anchorage.**—There is good anchorage on a 5-fathom (9.1 m.) bank, extending from the point between Beau Sejour and Halifax Bays, by keeping the southwestern point of the island open of Boismorice Point. The bottom may be seen and a vessel may conveniently land or take produce from either of the adjacent bays.

**Grand Mal Bay.**—St. Eloy Point, about 420 feet (128.0 m.) high, is about 1 mile northward of St. George. It has a reef extending 200 yards from it. Between it and Boismorice Point is Grand Mal Bay, where the water is smooth, and affords good anchorage on either side of a channel of deep water in the middle of the bay. In crossing this bay vessels are liable to sudden and heavy gusts of wind.

**Directions approaching Grenada from northward.**—Vessels approaching Grenada from the northeastward must guard against the effect of the equatorial current or indraft into the Carribean Sea, which, meeting the northeastern shore of South America, becomes concentrated and passes Grenada with accelerated force; it will be felt slightly while crossing the Atlantic if far south, but when in the longitude of Barbados will be generally found setting to the west-northwestward at from 1 to sometimes 3 knots, for which an allowance must be made. Having made the northeastern part of the island during daylight and bound to St. George, a vessel may pass through either of the channels northward of Grenada or run round its southern shore and work up from the southwestern point to the town. The three main channels between Grenada and Carriacou are deep, safe, and can not be mistaken; they are always used by those well acquainted with the navigation.

The first channel commencing from Grenada, is between Levera, a conical-shaped island 343 feet (104.5 m.) high, lying close off the northeastern point of Grenada and London Bridge, a remarkable



islet of rock, 75 feet (22.9 m.) high, with a hole in it, two smaller islets near it, and a rock uncovered at 400 yards to the southwestward of it. A bank with 6 to 10 fathoms (11.0 to 18.3 m.) of water surrounds these rocks, and 1 mile 82° from them is a bank with 8 fathoms (14.6 m.) of water over it. In taking this channel steer midway between the rocks and Levera Island and the least depth of water will be 17 fathoms (31.1 m.).

The channel north of London Bridge Rocks, or between them and Caille Islet, is clear of danger and carries 23 fathoms (42.1 m.) close to the latter. In passing through give the London Bridge Rocks a berth of more than 700 yards.

The channel between Diamond Islet (Kick'em Jenny) and the islets southward of the island of Carriacou is 5 miles wide, clear of danger, and carries over the bank from 25 to 30 fathoms (45.7 to 54.9 m.) of water. A shoal with 16 feet (4.9 m.) of water over it lies 800 yards from Bonaparte Rocks, at the southern end of the Carriacou group, which is the only danger to be avoided. (See view 29, Appendix V.)

After passing through either of the above channels the western coast of Grenada may be approached to the distance of  $\frac{1}{2}$  mile until off the town of St. George, the only dangers near which, for a vessel of more than 18 feet (5.5 m.) draft, are the Annas and Three Fathom Shoals, rising from a bank extending from the southern point of entrance to the harbor, which will be avoided by not going farther to the southward than to bring Fort George Point on with the prison bearing 98° until the harbor master arrives on board; or a vessel may round Fort George Point at a distance of 400 yards and anchor.

**From the southward.**—Should a vessel prefer to run round the southern end of the island, keep from  $1\frac{1}{4}$  to 2 miles from the coast to avoid the shallow ground which extends off all the southern points of the island until near The Porpoises, off Prickly Point, which may be passed at the distance of  $\frac{1}{2}$  mile. In rounding Glover Island and Saline Point, which is bold, perpendicular, and 100 feet (30.5 m.) high, in a heavy ship, keep fully 1 mile off to avoid the curve of the coast bank of 21 feet (6.4 m.) between the island and point and the Seringapatam Shoal. After passing Saline Point, so called from a salt pond, Mount Moritz open of St. Eloy Point will lead to the northward clear of all the shoals, or keep outside the 10-fathom (18.3 m.) curve; the eye will assist, as under that depth the bottom here is easily seen.

**BARBADOS** (*H. O. Chart 1010*).—Barbados is the easternmost of the extensive group termed the Windward Islands, and consequently the first landfall of vessels proceeding from Europe to the

islands to leeward of it or to the ports on the northern shore of Venezuela and New Grenada. The exact date of discovery is unknown, but it was probably first seen by the Portuguese in about the year 1600, and taken possession of by the British in 1625, in whose hands it has since remained. In form the island is an irregular triangle or pear shaped, with the pointed end to the north; its length in a north-northwestern and south-southeastern direction is about 18 miles, and the breadth between the extreme eastern point and Bridgetown 12 miles, the whole island containing an area of about 166 square miles.

**Population.**—The estimated population in 1926 was 169,385.

**Aspect.**—Notwithstanding its small extent, Barbados presents considerable variety of surface, as valley, hill, and table-land. A deep valley running almost east from Bridgetown divides the island into two parts, of which the northern is by much the larger. Near the center of the latter, Mount Hillaby, the highest part of the island, rises 1,104 feet (336.5 m.) above the sea. The general appearance of the island is low and level.

From the western coast the land rises in distinct successive terraces, interrupted by numerous and deep ravines, to the central ridge from which, and principally from Mount Hillaby, hills of a conical form range in a northeastern direction toward the sea. This high land is named Scotland. The hills are rugged and worn by the heavy rains and torrents which pour down their sides. Between the eastern and southern points the ground is nearly level, sloping gently to the sea cliffs, while from the eastern to the northern point the outline is broken and irregular. In clear weather the highest hills may be seen at a distance of about 40 miles.

The rivers are small except during the rainy season, when they are much increased in size. There are several mineral springs, containing chiefly iron, carbonic acid, and fixed alkali, in different proportions.

**Harbors.**—The only anchorage of any importance is Carlisle Bay on the southwestern side, which is available for all classes of vessels at all times, being well sheltered from the prevailing trade winds.

**Climate.**—Barbados is considered to be one of the most healthful islands in the West Indies; except the bilious and remittent fevers common to all the West Indies, there is no malignant disease peculiar to it.

**Winds and weather.**—The prevailing wind is the northeast trade, freshening during the daytime and falling light at night, January is generally dry; the breeze sets in early, and it is altogether one of the finest and most healthful months of the year. February partakes of the same character. March and April are the driest

months. May is also dry in the early part, but rain sets in toward the end. In June the breeze is light, the clouds are heavy, and thunder and lightning occur, with frequent showers. July is most oppressive, the regular trade wind is interrupted by breezes from the southwest and west; rain descends in torrents. August and September are very similar, with calms and light airs from the southward. From June to October is the hurricane season. October, toward the middle, becomes drier, and the refreshing trade wind sets in after thunderstorms. November is still rainy, the winds variable. December has almost daily slight showers, but the month is generally cool, and the trade wind becomes steady. (See Meteorological Table, Appendix IV.)

**Hurricane.**—While Barbados is in the hurricane zone and has at times been visited by disastrous hurricanes; these occur at rare intervals, the last one occurring in 1831.

**Storm signal stations** have been established at the undermentioned places on the island, in order to give due warning of the approach of a hurricane:

Place	Position
South Point Lighthouse.....	Lat. 13° 03', long. 59° 31'.
Highgate Signal Station.....	Lat. 13° 05', 30'', long. 59° 35'.
Police station E.....	Lat. 13° 15' 15'', long. 59° 37' 45''.
Police station C.....	Lat. 13° 09', long. 59° 28'.
Police station D.....	Lat. 13° 11', long. 59° 35'.
Police station F.....	Lat. 13° 13', long. 59° 33'.
Mount Standfast.....	Lat. 13° 12', long. 59° 37'.
Crane.....	Lat. 13° 06', long. 59° 26'.
Bathsheba.....	Lat. 13° 13', long. 59° 31'.

The signals consist of two red flags, with a black square in the center of each.

**Current.**—When beating up to Barbados from the westward, endeavor to keep directly under its lee in order to avoid the current which generally sets strong to the westward. Sometimes, however, the current varies its direction to northwest, and even as far as north, particularly between Barbados and Tobago, where the directions and velocity are considerably influenced by the wind. In the rainy season they are especially variable. Velocity ranges from 10 to 24 miles a day.

**Tidal currents.**—Within a short distance—about 1 mile—from the eastern and western shores of Barbados, the influence of the tidal currents is observed, the flood setting to the northwest and north and the ebb in the opposite directions. Off the southern coast the flood sets to the westward and the ebb to the eastward; velocity,  $1\frac{1}{2}$  to  $1\frac{1}{2}$  knots.

**Northeast coast** (*H. O. Chart 1010*).—From Kitridge Point, the eastern end of Barbados, the coast, forming a slight indentation, trends northwestward to the northern point and is formed of rocky cliffs varying from 50 to 800 feet (15.2 to 243.8 m.) in height, intersected by sandy bays and beaches which are skirted by a coral reef, always breaking, and which encircles almost the whole island. The reef fringing this coast extends from about  $\frac{1}{4}$  to  $\frac{1}{2}$  mile offshore.

**Ragged Point Light**, flashing white, 213 feet (64.9 m.) above high water, visible 21 miles, is exhibited from a white circular coral stone tower, 97 feet (29.6 m.) high, connected with the house. This tower is 300 yards from the extremity of the cliff. (See Light List.)

**Conset Bay**, 2 miles northwestward of Ragged Point Light, affords shelter for boats but is somewhat difficult of access.

The eastern end of the island is about 60 feet (18.3 m.) high and continues flat for about 2 miles inland, when it becomes more elevated, and at 3 miles within Kitridge Point is Moncrieffe Hill signal post, which stands 521 feet (158.8 m.) above the level of the sea.

**Mount Hillaby**.—At 3 or 4 miles to the northwestward the island begins to rise in rugged hills abruptly from the shore, and at 8 miles from the northern end and about midway between the eastern and western sides of the islands is Mount Hillaby, 1,104 feet (336.5 m.) high, the highest peak of the island. The high ridge terminates at the coast, about 4 miles from the northern point of the island, in a remarkable hill, named Pico Teneriffe, 269 feet (82.0 m.) high, which at a distance appears almost detached from the shore.

**Northern coast—North Point**.—The coast from Pico Teneriffe is composed entirely of low, rugged cliffs from 40 to 60 feet (12.2 to 18.3 m.) in height, and sweeps round the northern end of the island in a semicircle to Harrison Point on the opposite shore, and between these two points the island is about  $4\frac{1}{2}$  miles broad. For the first mile, from the northern point inland, the ground is level and open, and thence commences to rise gradually to the southward.

The reef in this space borders the shore at the distance of about  $\frac{1}{2}$  mile.

**Harrison Point Light** is a group flashing white light, 193 feet (58.8 m.) above high water, visible 20 miles, is shown from a white stone tower 85 feet (25.9 m.) in height, on Harrison Point. (See Light List.)

**Western coast**.—From Harrison Point the coast trends nearly south for  $12\frac{1}{2}$  miles to Pelican Island, at the northern end of Carlisle Bay; the shore is generally low, but a short distance inland it begins to rise in distinct successive terraces, interrupted by ravines toward the central ridge. These terraces may be traced all the way from Bridgetown to near Harrison Point, where they terminate in a bold bluff.

**Reef.**—The shore is slightly indented with sand beaches, the points being fringed by coral reefs, which off Harrison Point extend nearly  $\frac{1}{2}$  mile and are dangerous.

**Speights Town**, the largest community next to Bridgetown, is situated about  $3\frac{1}{2}$  miles to the southward of Harrison Point, and off it there is anchorage, but the roadstead is not frequented, as it is found more convenient to ship the produce in droghers, or small craft, and convey it to the vessels in Carlisle Bay.

**Hole Town** ( $13^{\circ} 11' N., 59^{\circ} 38' W.$ ), a small village about 4 miles farther to the southward, also has anchorage off it, and the roadstead is used for the same purpose as that of Speights Town.

**Pelican and Long Shoals.**—Pelican Shoals lie about  $1\frac{1}{2}$  miles northward of Pelican Island and  $\frac{1}{2}$  mile offshore. They are nearly dry, with 5 fathoms (9.1 m.) of water about 200 yards outside them.

Detached coral patches lie about 1,200 yards off Spring Garden Point, westward of Pelican Shoals, the shoalest of which, Long Shoal, has a depth of 4 fathoms (7.3 m.).

**Bell buoy.**—Long Shoal is marked by a bell buoy, moored on the northern part of the shoal.

**Oistin Bay** lies northwestward of South Point. It affords anchorage for small vessels in from 5 to 10 fathoms (9.1 to 18.3 m.) of water. Clear ground will be found in about 6 fathoms (11.0 m.), with Christ Church  $8^{\circ}$  and Kendal Point  $115^{\circ}$ . In hauling up for this anchorage take care to give a good berth to the reef extending from South Point. The whole of the coast between Needham Point and Oistin Bay shore is flat and low, but at a short distance inland the ground rises somewhat in terraces and  $\frac{1}{2}$  mile northward of Christ Church attains the height of 180 feet (54.9 m.).

**South Point**, to the southeastward of Oistin Bay, is the southernmost point of the island.

Coral reefs extend 600 yards offshore and  $\frac{1}{2}$  mile off South Point, having from 1 to 4 feet (0.3 to 1.2 m.) of water and generally breaking heavily. There is a boat channel inside these shoals.

**South Point Light**, flashing red, 145 feet (44.2 m.) above high water, visible 18 miles, is exhibited from a 90-foot (27.4 m.) tower painted in alternate red and white bands situated 200 yards inshore on South Point. (See Light List.)

There is a storm-signal station located at this Light.

**Coast—Cobbler Reef.**—From South Point to Kitridge Point the coast trends southwestward 9 miles, curving outward a little about midway. The shore is flat and composed chiefly of bold rocky cliffs from 50 to 60 feet (15.2 to 18.3 m.) high; in some places, however, the cliffs have been undermined by the sea and fallen in huge masses on the beach beneath.

Abreast New Fall Cliff, situated about 4 miles southward of Kitridge Point and 600 yards from the coast, is the southwestern extremity of Cobbler Reef, which extends at about the same distance offshore nearly as far as Lords Castle, Long Bay, having two gaps in the ridge of  $2\frac{1}{2}$  to  $1\frac{3}{4}$  fathoms (4.6 to 3.2 m.). Here the reef increases its distance from the coast to 1.1 miles off Palmetto Bay, which is 1,400 yards southward of Kitridge Point. Cobbler Reef here is about  $\frac{1}{2}$  mile in width, with from 2 to 8 feet (0.6 to 2.4 m.) of water, and breaks heavily even in the finest weather; inside the reef there are 3 or 4 fathoms (5.5 or 7.3 m.) with smooth water.

Eastward of Cobbler Reef, and nearly  $1\frac{1}{2}$  miles from the coast, a remarkable coral ridge, with from 7 to 10 fathoms (12.8 to 18.3 m.) on it, curves and extends to the southwestward at nearly a uniform distance offshore till abreast South Point. Between this and the inner reefs there are from 12 to 26 fathoms (21.9 to 47.5 m.). To seaward of these reefs the water quickly deepens to the 100-fathom (182.9 m.) curve, which will be found about 2 miles offshore. At spring tides there are overfalls off Cobbler and South Point Reefs. The prevailing current sets onto Cobbler Reef.

**Carlisle Bay approach.**—The approach to Carlisle Bay, the only good anchorage in Barbados, for vessels from the eastward is southward of the island, and to assist night navigation powerful lights have been established on Ragged and South Points. Ragged Point is situated about a mile northwestward of Kitridge Point, the eastern extremity of the island.

**CARLISLE BAY** ( $13^{\circ} 06' N.$ ,  $59^{\circ} 37' W.$ ; *plan on H. O. Chart 1010*), the principal anchorage in the island, along the shores of which is situated Bridgetown, the capital of Barbados, is an indentation of about  $\frac{1}{2}$  mile, and formed between Pelican Island and Needham Point, which lie in a general northwest-southeast direction from each other, distant  $1\frac{1}{2}$  miles. It affords anchorage for all classes of vessels.

**Depths.**—There is sufficient depth in the bay for all types of vessels, varying from 18 fathoms (32.9 m.) in the northern part of the bay to  $4\frac{1}{2}$  fathoms (8.2 m.) in the central part. The depth in the southern portion again increases to from 12 to 20 fathoms (21.9 to 36.6 m.).

Conspicuous objects in entering the bay are Highgate storm signal station, Needham Point Lighthouse, Savanna Club clock tower, and the tall chimney of the sugar refinery, one-half mile to the northward; St. Mary's Church, Bridgetown; the quarantine house on Pelican Island; two gray lattice masts 206 feet (62.8 m.) high; two domes surmounting Bridgetown Club; a square gray

clock tower with four short spires; a red chimney about 200 yards northeastward of Needham Point Lighthouse; St. Michael's Cathedral square tower; Roman Catholic chapel, gray roof, and diminutive bell spire; tall radio mast in St. Anne Fort; Engineer's Wharf; Charles Fort signal tower; and a pavilion with a red roof on the Aquatic Club Pier.

**Pelican Island** is a low, rocky islet which forms the northern extremity of Carlisle Bay. There is a quarantine station and several houses on it. Shallow water extends from 200 to 300 yards westward and southward of it.

Savanna Clock Tower, in range with the end of the groyne which incloses the drainpipe, leads outside the foul ground extending from Pelican Island.

**Shoals.**—In the northern part of Carlisle Bay there are coral patches, having from 4 to 5 fathoms (7.3 to 9.1 m.) of water on them, but they will be avoided by not standing farther to the north than to bring the refinery chimney, situated near the shore in the center of the bay, bearing 90°.

The chimney is not easy to make out when coming from the northward, but about 200 yards to the southward of it there is a most conspicuous gasometer. The range which clears the spit off Needham Point also leads westward of the patches.

**Needham Point Spit.**—From Needham Point, which may be easily known by the forts and signal staff at its extremity, a rocky spit with less than 3½ fathoms (6.4 m.) extends 600 yards to the westward.

**Buoy.**—A red buoy with staff and ball is moored on its edge in 5 fathoms (9.1 m.) of water with the fort signal staff 103° distant 600 yards.

**Range for clearing.**—As the buoy occasionally breaks adrift, vessels approaching from the eastward should keep outside the range of the northern extremity of the land on with the eastern end of Pelican Island bearing 342°, until the flagstaff of Fort Charles on the point is in range with St. Ann Fort, where they may haul to the northeastward and anchor as convenient.

**Needham Point Light**, fixed white with red sector, 60 feet (18.3 m.) above high water, white light visible 7 miles, red light visible 3 miles, is exhibited from an octagonal tower, painted white, on Needham Point. (See Light List.)

**Signal stations** at Commercial Hall, Chamber of Commerce, and at Clapham, 2 miles from Bridgetown, communicate with incoming vessels.

**Carenage lights.**—A fixed red light is shown at the northern side of the entrance to the Carenage, and a fixed green light 24 feet

(7.3 m.) high, visible 1 mile at the southern side. A red light 25 feet (7.6 m.) high is exhibited on the end of the police wharf.

**Wrecks.**—The wreck of the French tug *Berwind*, with mast, stack, and roof of deck house above water, lies sunk in  $3\frac{1}{2}$  fathoms (6.4 m.) of water, in the eastern part of the bay, with Needham Point Lighthouse bearing  $173^\circ$ , the clock tower bearing  $139^\circ$ , and the refinery chimney bearing  $43^\circ$ . No light is shown from the wreck at night.

The stranded wreck of a schooner lies 460 yards  $132^\circ$  from the light on the outer end of the police wharf.

**Anchorage.**—Merchant vessels anchor in the northern part of the bay. The Royal Mail steam packet mooring buoy lies in about 12 fathoms (21.9 m.) 1,090 yards,  $332^\circ$  from Needham Point Lighthouse. There is no other mooring buoy in the bay. Naval vessels usually anchor in the southern part of the bay, which is usually clear.

For a large vessel the best berth is in 16 fathoms (20.3 m.) with the clock tower bearing  $122^\circ$  and Clapham Mill open northward of Britton's Mill  $88^\circ$  or the flagstaff of St. Ann Fort bearing  $128^\circ$ . Britton's Mill and Clapham Mill are most difficult to make out from seaward.

Smaller vessels anchor inshore of this, according to draft. The bottom is foul and uneven in many parts, but an anchor is seldom lost. In the bay the tidal streams are weak and irregular.

Vessels of draft up to 14.5 feet (4.5 m.) moor alongside the wharves of the carenage.

The quarantine anchorage is to the southward of Pelican Island, in 12 fathoms (21.9 m.)

**Oiling berth.**—A submerged pipe line, indicated by a dashed line on the chart, extends for about 400 yards in a northwesterly direction from a position on the shore about 300 yards southwestward of Engineer's Pier. Two can buoys mark the outer end of the pipe line, and mooring buoys are situated about 100 yards northeastward and 100 yards southwestward of the can buoys. Vessels up to 600 feet in length can be moored between the buoys, and the depth at the berth is about 8 fathoms (14.6 m.). Two beacons on the shore about 200 yards northward of Needham Point Lighthouse when in line bearing  $145^\circ$  indicate the direction of the pipe line; the beacons are 40 yards apart.

**Tides.**—The high-water interval at Barbados is 2h. 50m. The mean range of tides is 2.3 feet (0.7 m.) and the spring range is 3.1 feet (0.9 m.).

The tidal current in Carlisle Bay is weak and irregular.

**Pilots** are available and meet all ships which ask for them at a distance of 2 or 3 miles from the anchorage.



Ships requiring a pilot should inform their agents or the harbor master, by radio, giving the approximate time of arrival, and stating whether they are approaching from a northerly or southerly direction.

Pilot vessel is usually sailing vessel, flying a red and white horizontally striped flag.

**Port regulations.**—All naval vessels arriving after 6 a. m. and up to 9 p. m. will be visited by the harbor master; naval vessels arriving after 9 p. m. will be visited on the following morning.

**Directions.**—There are no difficulties in the way of steamers or sailing vessels with a fair wind approaching and entering Carlisle Bay either by day or night. From the eastward the shore should be given a berth of about 2 miles, and at night the lights on Ragged, South, and Needham Points afford easy facilities for fixing position. Sailing vessels from Europe or from the southeastward, when within about 120 miles of the meridian of Barbados, should endeavor to keep on the parallel of South Point, latitude  $13^{\circ}$  north.

It has frequently been observed that, at the distance of about 200 to 240 miles eastward of the island, muddy discolored water is sometimes met with, having the appearance of soundings, most probably caused by the débris thrown out of the great rivers on the adjacent coast during the rainy season.

Sailing vessels, when approaching Barbados from the northward, keep if possible well to the eastward of the island, in order to pass to windward of it, guarding against the westerly set, and having rounded Cobbler Reef at the distance of 3 miles, the coast may be skirted about 2 miles offshore. Should it be sighted in the night from the northeastward, the light on Ragged Point will be the guide, remembering that to clear Cobbler Reef it must not be brought to bear northward of  $292^{\circ}$  till South Point Light is seen.

Should vessels coming from this direction get to leeward and be obliged to pass westward of the island, a berth of about 2 miles should be given to the reef off the northwestern point, and the shore must be approached carefully. Soundings extend some short distance outside the reefs, 20 fathoms (36.6 m.) being found at about  $\frac{1}{2}$  mile; a depth of not less than 10 fathoms (18.3 m.) will clear them.

Approaching Carlisle Bay from the northwestward do not haul round Pelican Island until the clock tower is open southward of the gateway bearing eastward of  $121^{\circ}$ .

**At night.**—Vessels bound to Carlisle Bay from the eastward or southward should give the flashing red light on South Point a berth of at least 2 or 3 miles, and after passing it may haul up for the light on Needham Point showing red, keeping South Point Light in sight

until Needham Point Light shows white, then haul up  $53^{\circ}$  for the anchorage. Keep the lead going when nearing the point, and on hauling up into the bay when the white light is seen bear in mind that the rocky spit from Needham Point is steep-to.

The south face of the clock on the tower of a public building, northward of the carenage, is illuminated by an electric light thrown onto it, giving it the appearance of a square dullish white light, which is quite distinctive and is useful when approaching from the southward, when possibly the lights at the entrance to the carenage are hidden by shipping.

In approaching the bay from the northward keep about 2 miles offshore, and when Needham Point Light is seen it may be steered for when bearing eastward of  $132^{\circ}$ , which leads clear of Pelican Island Spit.

**BRIDGETOWN** ( $13^{\circ} 06' N.$ ,  $59^{\circ} 37' W.$ ; plan on *H. O. Chart 1010*), the capital, containing a population of about 15,000 situated mainly northward of a rivulet, in Carlisle Bay, at the southwestern end of the island, but it extends along the shore of the bay for nearly 2 miles. Though irregularly built, it contains several handsome houses and a large square adorned with a statue of Nelson. It has a cathedral, which is spacious and plain, its tower scarcely rising above the roof for fear of hurricanes, for which reason also the churches are without steeples. Besides the churches there are several chapels and many schools. A college founded by General Codrington, formerly governor, is pleasantly situated on the eastern side of the island. At the southern extremity of the town is St. Ann Fort, with its spacious barracks and extensive parade ground. The town is abundantly supplied with excellent water, led in from Newcastle on the eastern coast, and an effective system of hydrants is maintained. A railway crosses the island from Carlisle Bay to Conset Point and thence along the eastern coast of St. Andrews Bay.

The United States is represented by a consul.

**Wharves.**—There is no wharf capable of accommodating ships with draft of more than 14.5 feet (4.5 m.). Cargo from deep-draft vessels is handled by means of 20 to 30 ton lighters, of which there are a sufficient number.

There are numerous cranes to handle cargo, ranging in capacity from 2 to 25 tons.

**Tugs.**—There are Government-owned tugs for handling lighters.

**Boat landing.**—Landing steps for boats at carenage are kept lighted at night.

**Dock.**—Southward of the carenage is Blackwood Dry Dock. It is a screw-lifting dock 240 feet in length, 46 feet in width, and 15 feet (4.6 m.) in depth, and is capable of lifting vessels of 1,200 tons weight and of 14 feet (4.3 m.) draft. At the upper part of the carenage there is a crane capable of lifting 13 tons. (See Appendix II.)

**Repairs.**—Facilities are very limited.

**Supplies.**—Ship chandler and commissary provisions, both fresh and dry, can be obtained in any quantity. Engineer supplies can be obtained in small amounts.

**Coal.**—About 8,000 tons of American coal is kept in stock. Steamers are coaled in the stream from 25-ton lighters.

Water is delivered on board by the Government steam water boat; water is also laid on to the quay side in the carenage. The signal for water is the letter P, of International Code, half-masted on mainmast.

**Fuel oil.**—About 400 barrels of fuel oil is ordinarily available for purchase.

**Communication.**—Barbados has communication by telegraph cable, via the West Indies and the United States, with England and with Demerara. It has also communication by lines of steamers with the United Kingdom, Tenerife, Sweden, Mediterranean ports, Canada, Bermuda, the United States, ports in the Gulf of Mexico, South America, and Calcutta.

There is no inland telegraph service, but there is a complete telephone system, and a railroad across the island.

**Radio.**—There is a radio station located on Needham Point, which handles commercial messages.

The sanitary condition of the towns is excellent.

**Hospital.**—There is a general hospital with accommodations for 250 patients. The general hospital will accept seamen as patients.

**Quarantine regulations.**—The quarantine flag should be hoisted on entering port. The harbor master boards all incoming vessels and requires a bill of health; he also issues bills of health.

## CHAPTER VI

### TOBAGO AND TRINIDAD

**TOBAGO ISLAND** ( $11^{\circ} 15' N.$ ,  $60^{\circ} 40' W.$ ; *H. O. Chart 1618*) was discovered by Columbus on his third voyage, in 1498. It was settled successively by the English, Dutch, Spaniards, and French, finally being transferred by the latter to Great Britain in 1814.

**Aspect.**—The island is about 23 miles in length in a northeasterly and southwesterly direction, and  $6\frac{1}{2}$  miles across at its greatest breadth, with an area of 114 square miles, the shores being generally bold, steep-to, and fairly indented. A ridge of irregular mountains, commencing at the northeastern extremity, extends through the island for nearly two-thirds its length at an elevation in some parts of 1,900 feet (579.1 m.). The summits of the ridge are generally rounded and do not present any of those volcanic features that are seen at the neighboring islands to the northward. The island is clothed with forests, which cover about one-third of the total area; the slope on the northern side is more or less steep, but on the southern side, between the spurs of the hills extending to the coast, are several valleys, well watered, in which are the chief areas of cultivation. The southwestern district consists mainly of low plains with hills dotted about.

**Population.**—The population of the island is about 23,350.

**Anchorage.**—The best anchorages are King and Rockly Bays on its southern side and Man-of-war and Great Courland Bays on the northern side. Rockly Bay is the most frequented.

**Climate.**—The climate of the island is hot, but comparatively dry and healthful, and is said to be more healthful than that of Trinidad. The mean annual temperature is about  $81^{\circ}$ , and the annual average rainfall on the windward side is about 65 inches.

**Winds.**—At Tobago Island the trade wind does not blow steadily, but is fitful and uncertain, and there is a large proportion of calm weather, more particularly in the hurricane months. Much rain falls, and short squalls are frequent. Tobago is out of the path generally followed by hurricanes, but minor disturbances of that character have occurred both here and at Trinidad.

**Ground swell—Caution.**—The northern side of this island is in the winter months subject to a ground swell, which generally sets

in with light winds; occasionally it breaks heavily over Buccoo Reef and Drew Bank. Vessels have at such times to leave the northern bays. The southeastern side of the island is continually exposed to a heavy swell, and, as the current generally sets strongly toward the shore, sailing vessels should not be navigated within the distance of 3 or 4 miles.

**Current.**—Tobago, being in a prominent position off the north-eastern coast of South America, is subjected to much of the force of the equatorial stream and outpouring from the nearer large rivers. This current, with a general motion to north-northwest, strikes Tobago on its southern side, and dividing, one part rushes past the eastern end with a velocity of 3 to 4 knots, while the other part passes between these islands; and although slightly modified by the ebb tidal current, is generally running so strongly to the northwestward that sailing vessels can not work up against it; therefore vessels coming from the Atlantic should, when approaching the island, make due allowance for it.

Between Tobago and Barbados the current is generally found running to the northwestward with a velocity of 1 to 3 knots, but sometimes a cesation for a short time occurs.

**Tides.**—High-water interval around the coasts of Tobago Island is 3h. 50m.; spring range 2.1 feet (0.6 m.) and mean range of 1.6 feet (0.5 m.), but they are very irregular.

The tidal currents about Tobago are uncertain, being almost overcome by the prevailing current, the general effect being that the flood accelerates the westerly current, while the ebb retards it; the flood at the east extremity of the island presses the current close to the shore, whereas the ebb carries it off.

At the western extremity of the island the flood sets southeastward close round Crown Point and over the Wasp Shoal for two hours, during its strength just checking or throwing off the westerly current, but this effect soon ceases. On the northern side, at Courland Bay, during the flood there is a slight eddy set near the shore to the eastward, and during the ebb there is a set in the reverse direction, sometimes near the Buccoo Reef attaining a velocity of 1 knot.

**General directions.**—**Working to windward** on the coast of Tobago will be attended with difficulty, except on the northern side inside the range of the current, and then on arriving at the St. Giles Islands a vessel will require the wind northerly and strong to be able to cross it. Should she, however, lie up southeast by east, she will soon make easting enough to keep away; if bound to Scarborough, Little Tobago should be given a wide berth.

Being at the western extremity of the island and desirous of proceeding up the southern side to Scarborough, a vessel should round Crown Point as close as the ledge will allow; and if able to lie up

southeast by east, continue on the port tack until eastward of Galera Point, the northeastern extremity of Trinidad. Here the current will be found setting north, and in this position short tacks must be made to windward, finally making one stretch across to the island of Tobago, but this can not be done unless the wind is inclined to the north and the vessel sails well.

A vessel can work to windward along shore from Scarborough with a favorable breeze. Off Smith Island the westerly current will be feeble, and off Richmond Island a slightly favorable or eddy set will be met with. Avoid Pedro Point and the rocks southward of Little Tobago, for the current sets about 4 knots in this vicinity and with light winds renders a vessel unmanageable.

**North coast—St. Giles or Melville Islands** ( $11^{\circ} 21' N.$ ,  $60^{\circ} 31' W.$ ; *H. O. Chart 355*).—This group of bold rocky islands lies  $\frac{1}{2}$  mile off the northeastern extremity of Tobago Island and is steep-to. The westernmost rock, 600 yards from the large island of the group is remarkable, having an arch worn through it by the sea; it is known as London Bridge Rock. Marble Island, the northernmost, 146 feet (44.5 m.) high, is nearly white and is 600 yards to the northward of the largest island.

The southern and largest island is 400 feet (121.9 m.) high at its eastern end.

**Channel Rock.**—Midway in the channel, nearly  $\frac{1}{2}$  mile wide, between Tobago Island and the southwestern extremity of the largest of St. Giles Islands, there is a rock awash; though the channels on either side of it have depths of 15 fathoms (27.4 m.) or more, they are considered dangerous for sailing vessels, both on account of their narrowness and the strong currents prevailing. Vessels therefore should pass outside the St. Giles Islands.

**Man-of-war Bay**,  $\frac{1}{2}$  miles wide at the entrance, is situated 2 miles southwestward from St. Giles Islands and affords anchorage for a number of vessels in the eastern part in depths of 10 to 20 fathoms (18.3 to 36.6 m.). The only danger is Cardinal Rock, awash, lying 400 yards off the western shore; it generally breaks. At the head of the bay is Booby Islet, steep-to on the outside but with shallow water within; along the eastern and southern parts of the bay fringing reefs extend about 150 yards in places.

**Landmarks.**—The school, which has a short spire and is not unlike a chapel in appearance, is conspicuous, standing on higher ground above the village. A black hut with red roof, which is easily distinguished from neighboring houses, is situated on the beach westward from the school. The Government Rest House, which stands alone, is situated near Charlotteville; it is a small gray

hut with red roof, under the coconut palms. The Hermitage, a conspicuous house, stands on the point  $\frac{1}{2}$  mile southward of Cardinal Rock.

**Anchorage.**—The best anchorage for large vessels is in 11 to 15 fathoms (20.1 to 27.4 m.) with Booby Island bearing from  $225^{\circ}$  to  $247^{\circ}$ . Small vessels may go nearer the shore. This anchorage is perfectly safe.

**Directions—Sailing vessels.**—A sailing vessel entering Man-of-war Bay should keep one-third of the width of the entrance from the eastern point and stand over quite close to Booby Island on the first tack, being prepared when in the bay for baffling and irregular winds. Should she fetch to leeward of Booby Island, tack when it comes on with the northern extremity of the long sandy bay on the eastern side, and when standing northward avoid getting becalmed under the eastern entrance point, near which eddies from the westward might set a vessel close to the rocks.

**Charlotteville** is the small town situated at the head of Man-of-war Bay. Here water may be conveniently obtained from a stream at Charlotteville in the eastern part of the bay. Fresh fish, fruit, fowls, eggs, and milk are obtainable. Wood also is plentiful. There is no coal depot.

**The Brothers** ( $11^{\circ} 20' N.$ ,  $60^{\circ} 35' W.$ ; *H. O. Chart 1618*) are two rocks 15 feet (4.6 m.) in height, lying 2 miles westward of Corvo Point, Man-of-war Bay, and 600 yards offshore. There are other rocks which uncover between them and the land; therefore a vessel should never attempt to pass inside.

At about 1,200 yards westward of the Brothers and  $\frac{1}{2}$  mile from the shore there are two rocks, one of which dries, and the other has 4 feet (1.2 m.) of water; they are generally marked by breakers. In passing between the Sisters and the shore, which channel is not recommended, keep nearer the Sisters to avoid these rocks.

**The Sisters** are a group of five rocks above water, and three under water, which break, lying  $1\frac{1}{2}$  to 2 miles from the Brothers and  $1\frac{1}{2}$  miles offshore. The highest and northernmost rock is 98 feet (29.9 m.) in height.

**Anchorage.**—From Corvo Point to Courland Point, a distance of about 14 miles, the northern coast of Tobago Island is generally rocky, bold, and steep-to. In this space are several small bays, known as Bloody, Parlatuvier, Englishman, Castara, King Peter, and Fromager Bays, all of them affording anchorage for very small vessels, but, with the exception of Castara Bay, not very secure. Several rocks lie off the coast, but in no case beyond the distance of 300 yards.

**The coast** from Man-of-war Bay extends in a generally south-westerly direction for 14 miles to Great Courland Bay. The coast is bold and steep-to with the 20-fathom (36.6 m.) curve between  $\frac{1}{4}$  and 1 mile off shore.

**Great Courland Bay** ( $11^{\circ} 13' N.$ ,  $60^{\circ} 46' W.$ ; *Plan on H. O. Chart 355*).—This bay is the principal anchorage on the northern side of Tobago Island and is the location of the town of Plymouth.

Between Courland Point and Hawks Bill Point it is nearly 1 mile wide and 800 yards deep, with depths gradually increasing from the shore. The only danger is the Barrel of Beef Rock; with 2 feet (0.6 m.) of water over it at 300 yards southwestward of Courland Point it is not always discernible at high water.

With the wind northward of east a swell sets into the bay, but the holding ground is good.

Vessels should not anchor within a depth of 7 fathoms (12.8 m.); large vessels should anchor in 10 fathoms (18.3 m.). A steamer can enter Great Courland Bay at night after having made out its position, and it can be left with great facility.

**Stone Haven**, between Great and Little Courland Bays, is very open and not good for anchoring.

**Little Courland Bay**, the next opening to the southwestward, is a smoother anchorage than Great Courland Bay, being protected by a more salient eastern point, on which are the remains of an old Dutch fort. The produce of the vicinity is shipped in this bay.

The best anchorage is in the eastern part of the bay in 7 fathoms (12.8 m.), with the central rocky point on which stands the building of the Mount Irvine estate, bearing  $120^{\circ}$ .

In leaving this bay, if the wind be light and variable, care is required in a sailing craft to prevent being set toward Buccoo Reef, as there is generally a current to the southwestward.

**Buccoo Reef**, with depths of 1 fathom (1.8 m.) and less, extends in patches to the distance of  $1\frac{1}{4}$  miles offshore, between Wolf Rock, off the western point of Little Courland Bay and Pigeon Point, nearly 2 miles to the westward; its edge uncovers and is clearly defined. At night this is a dangerous reef, but it may be avoided, when the land can not be seen, by keeping in a greater depth than 20 fathoms (36.6 m.).

**Buccoo Bay**, situated within Buccoo Reef, is dangerous for boats, as rollers set in suddenly over the shadows inclosing it. Several accidents have occurred, and the shoals are known as the Buccoo Burial Ground.

**Milford Bay**, situated at the western end of Tobago Island, between Sandy and Pigeon Points, affords good anchorage; a rock with 1 fathom (1.8 m.) of water over it lies 300 yards from the shore, near the middle of the bay. In standing into this bay care must be taken not to round either Buccoo Reef or the ledge off Crown Point too closely. A small craft may anchor in 7 fathoms (12.8 m.) with the only house on the beach bearing  $79^{\circ}$ .



**South coast—Eastern end.—Little Tobago Island** ( $11^{\circ} 18' N.$ ,  $60^{\circ} 30' W$ ; *H. O. Chart 355*) 470 feet (143.3 m.) high, lies 1 mile off the eastern extremity of Tobago, and is bold and steep except for the rocks noted below. Off its southwestern shore are Northeast Middle, 21 feet (6.4 m.) high, and South Rocks, 18 feet (5.5 m.) high. Northeast of South Rock, distant 200 yards, is a submerged rock upon which the sea breaks.

**Goat Island** lies 1,300 yards to the westward, between the main island and Little Tobago. Black Rock lies north-northeastward, 800 yards from the northern point of Little Tobago. (See view 28, Appendix V.)

**Channels.**—Between Little Tobago and Goat Island, and between Goat Island and Tobago, there are channels with from 20 to 30 fathoms (36.6 to 54.9 m.) of water, but the current in them runs so strongly to the northward, from  $2\frac{1}{2}$  to 4 knots, that sailing vessels should never attempt to pass through, nor should steamers do so unless they have a particular object to attain. There are several rocks above and below water in them as charted.

**Tyrrel Bay**, westward of Goat Island, affords indifferent anchorage with deep water, though vessels of about 150 tons sometimes ship produce here.

To enter it a commanding breeze is necessary, and the southern channel, westward of South Rock, is 18 feet (5.5 m.) high, is the only safe one to take. Do not attempt to pass between South Rock and Little Tobago, as the current splits over the middle rock dangers and is very strong. When leaving, a sailing vessel should wait until the wind inclines to northeast; she will then lie out on the port tack, with the current assisting her under the lee bow.

**Coast.**—Between Tyrrel and King Bays the coast trends in a generally southern direction for  $2\frac{1}{4}$  miles to Pedro Point, is bold, rough and dangerous for boats or sailing vessels to approach, owing to the current constantly setting against the wind, with several small bays exposed to the prevailing winds.

**King Bay** is the deepest and safest indentation in Tobago, and the only anchorage that has nearly always smooth water. Detached patches of 5 and 8 fathoms (9.1 and 14.6 m.) lie near the fairway, and the flats of less than 3 fathoms (5.5 m.) fringe the shore for a distance of 200 to 400 yards, with an isolated shoal of  $3\frac{1}{4}$  fathoms (5.9 m.) on the eastern side. The best anchorage is near the head of the bay in 7 to 10 fathoms (12.8 to 18.3 m.) secure from all ordinary winds.

As King Bay is surrounded by high land, the wind when quite steady outside will be very uncertain within; for as soon as Pedro Point, the eastern point of entrance, is passed, calms and baffling winds will probably be met. Always be prepared to anchor, and

do not stand too close to the lee side when working in. When leaving, choose early morning, as the wind then generally blows out of the bay, but be prepared on opening Pedro Point for changes in its direction.

**Queen Bay.**—Off the southern part of the land which forms the western entrance point of King Bay lies Queen Island, 190 feet (57.9 m.) in height; and at  $\frac{1}{2}$  mile northwestward of the island is Queen Bay, fronting the estate of Betsys Hope. This anchorage is nearly always accessible to sailing vessels, and is easy to leave, but it is only suitable for small craft, as these are not affected by the patches of  $2\frac{1}{2}$  fathoms (4.6 m.) on either side of the fairway. The anchorage is in 5 or 6 fathoms (9.1 or 11.0 m.) at about 400 yards off the beach.

**Prince Bay** forms the continuation westward of Queen Bay; Roxborough Rock, 53 feet (16.2 m.) high, with a shoal of 2 fathoms (3.7 m.) lying 400 yards westward of it, and a series of shoals between it and the shore, divide these bays from each other; a rock which dries and is awash at high water, on the eastern extremity of a 3-fathom (5.5 m.) shoal, lies 900 yards  $236^\circ$  from Roxborough Rock, and between them is the entrance to Prince Bay.

To enter, pass a little to the eastward of the rock awash at high water, from which a north course leads to a good position in 7 fathoms (12.8 m.).

Inside the depth of 5 fathoms (9.1 m.) the ground is foul all around this bay; it should not be entered with a light wind, and it would be well to obtain a pilot from the vicinity.

**South coast.**—From Prince Bay to Richmond Island the shore is fronted by many rocks; vessels should avoid this locality.

**Richmond Island** ( $11^\circ 12' N.$ ,  $60^\circ 35' W.$ ; *H. O. Chart 1618*), situated  $2\frac{1}{2}$  miles southwestward of Queen Island, lies 400 yards off a salient point; it is a double island, with a hummock on each part; there is a group of rocks about 200 yards northward of its eastern extremity, and a patch of 3 fathoms (5.5 m.) about  $\frac{1}{4}$  mile southwestward of it. There is also a patch of  $2\frac{1}{2}$  fathoms (4.6 m.) 1,200 yards westward of the island.

**Mangrove Bay**, situated northward of Richmond Island, within the island above mentioned, affords secure anchorage for small vessels. A rock, which dries, lies in the fairway; pass to westward of this and anchor in 3 to 4 fathoms (5.5 to 7.3 m.).

**Richmond and Goldsborough Bays**, lying southwestward of Mangrove Bay, have very irregular depths off them; small vessels anchor in them to load produce, but there is no suitable anchorage for large vessels. There are patches of rocks off the point between these bays, and a patch which breaks between them and Richmond Bay.

**Great River Shoal.**—Smith Island, 48 feet (14.6 m.) high, lies 4 miles southwestward of Richmond Island, and between them, off Goldsborough Bay, lies Great River Shoal, which extends  $1\frac{1}{4}$  miles from the shore, within the depth of 5 fathoms (9.1 m.) and has in many places depths of 17 and 18 feet (5.2 and 5.5 m.) over irregular coral bottom.

During strong east-southeast breezes this shoal break heavily.

A rock, known as Little Smith Island, lies about 200 yards  $247^{\circ}$  from Smith Island, and a patch which breaks lies 300 yards north-eastward of the latter.

**Range for clearing.**—The eastern extremity of Little Tobago Island kept open of Pedro Point, bearing  $46^{\circ}$ , leads southeastward of Great River Shoal.

**Barbados Bay**, 1 mile westward of Smith Island, lies within Granby Point, on which are the remains of an old fort. Foul ground, with several heads of 2 to 3 fathoms (3.7 to 5.5 m.) extends about 800 yards in all directions off the point. This bay is not suitable for vessels above 12 feet (3.7 m.) draft.

**Directions for entering.**—Green Hill House in range with the western end of the sandy beach  $8^{\circ}$ , leads westward of the dangers off Granby Point; when Little Smith Island is shut in with Granby Point the vessel will be northward of these dangers and should haul up quickly for a weather position in the bay; in doing this the vessel will probably get into a depth of 15 feet (4.6 m.).

**Hillsborough Bay** lies westward of Barbados Bay, off the Hope Estate; vessels may anchor in the eastern part in 6 fathoms (11.0 m.); the wind generally blows along shore; there are no dangers in the approach.

A bank with  $3\frac{1}{2}$  fathoms (6.4 m.) extends 800 yards off the point, which is 186 feet (56.7 m.) high,  $11\frac{1}{2}$  miles southwestward of Hillsborough Bay. It breaks during strong sea breezes.

**Minster Rock** ( $11^{\circ} 10' N.$ ,  $60^{\circ} 42' W.$ , *H. O. Chart 355*), with a least depth of 6 feet (1.8 m.) of water, lies  $167^{\circ}$  distant 1,200 yards from the point just mentioned, and  $105^{\circ}$  nearly 1 mile from Bacolet Point; it is composed of large bowlders, is steep-to, and with the usual sea breeze it generally breaks.

**Danger range.**—Fort George flagstaff bearing  $311^{\circ}$  leads westward of the rock, and Richmond Island open southward of Smith Island  $59^{\circ}$  leads eastward.

**Rockly Bay** ( $11^{\circ} 11' N.$ ,  $60^{\circ} 44' W.$ , *H. O. Chart 355*), comprised between Bacolet Point and a point situated  $3\frac{1}{2}$  miles west-southwestward of it, affords anchorage in 6 to 16 fathoms (11.0 to 29.3 m.), mud and sand bottom; although a safe anchorage, it is

never very smooth, as the trade wind causes a continuous swell to set into the bay. Scarborough, the principal town in Tobago, is situated at its head.

**Landmarks.**—The following objects are conspicuous from seaward: The hospital, a low red building, with several outhouses, situated on the western side of the bay; the ruin of Montpelier old mill, and the range beacons, forming the leading marks for entering; Fairfield, a long gray building on the eastern side of the bay; Fort George Lighthouse, flagstaff, and radio masts, and Red Rock, all very conspicuous.

**Dangers.**—**Lighthouse Ledge**, with a depth of 12 feet (3.7 m.) near its southern extremity, extends 500 yards from Bacolet Point; from this ledge to the town of Scarborough the depth of 5 fathoms (9.1 m.) is in no place more than 200 yards offshore.

Rocks under Fairfield in range with Whim Chimney  $320^{\circ}$  lead westward of Lighthouse Ledge.

**Bulldog Shoal.**—Several shoals encumber the middle and western parts of Rockly Bay; of these, the Bulldog, 500 yards long, north and south, and 300 yards wide, with  $1\frac{1}{4}$  fathoms (2.3 m.) lying with Bacolet Point, bearing  $236^{\circ}$  over 2 miles distant, is the outer; it usually breaks. A 3-fathom (5.5 m.) spot lies 400 yards eastward from this shoal.

French Hill (over Fort George), in range with 2-story house, bearing  $18\frac{1}{2}^{\circ}$ , clears Bulldog Shoal.

**Red Rock**, 18 feet (5.5 m.) in height, lies about  $2\frac{1}{4}$  miles  $241^{\circ}$  from Fort George Light. Other shoals with from  $1\frac{1}{2}$  to  $2\frac{3}{4}$  fathoms (2.7 to 5.0 m.) extend about 1,500 yards eastward of Red Rock, or halfway across to Lighthouse Ledge; the shoals break with a fresh trade wind, but not otherwise. The above clearing mark for Bulldog Shoal leads eastward of the above dangers.

**Beacon.**—There is a beacon about 10 feet (3.0 m.) in height on Red Rock, with topmark consisting of two triangles, points together, the upper painted white and the lower black, which is conspicuous from seaward.

**Middle Shoal** lies in the upper part of the bay, above and westward of the anchorage for large vessels, and is 400 yards in length with a least depth of  $1\frac{3}{4}$  fathoms (3.2 m.). Its southeastern extremity is 700 yards from the eastern shore.

**Fort George Light**, fixed white, 478 feet (145.7 m.) above high water, visible 12 miles, is exhibited from a white lighthouse, 19 feet (5.8 m.) high, at Fort George, Scarborough. (See Light List.)

**Range beacons.**—Two small beacons, painted white, with triangles, are situated close westward of the lower town of Scarborough for the convenience of the mail steamers; one stands on the beach and

the other lies about 320 yards  $336^\circ$  from it. Occasional lights are shown from them for Government Coastal Service or local vessels.

These beacons in range bearing  $336^\circ$ , lead in, clear of danger to the anchorage. (See view B on H. O. Chart 355.)

**Directions.**—When coasting along the southern side of Tobago Island from the eastward, Little Tobago must be kept open, south of Pedro Point, bearing  $46^\circ$ , to avoid Great Salt Shoal. Continue on the same course until abeam of South Island, when course may be altered to the right, to make good  $81^\circ$ . This course will lead 1,400 yards to the southward of Minster Rock. Richmond Island, in range with South Island, bearing  $59^\circ$ , will show that vessel is well clear of rock. When Fort George Light bears  $311^\circ$ , (see view A on chart), ship will be to the westward of Minster Rock and course may be changed to the right to head into bay until the range beacons bearing  $336^\circ$  are in range. Stand in on this range, anchoring eastward of Middle Ground in about 12 fathoms (21.9 m.)

In large sailing vessels it is not advisable to proceed so far, but anchorage should be taken up in 14 to 16 fathoms (25.6 to 29.3 m.) with Fort George bearing from  $23^\circ$  to  $45^\circ$ .

From the westward, observe the clearing mark for Bulldog and the other shoals before mentioned until the range beacons are in range.

A sailing vessel with the usual sea breeze can follow the same track, but with the wind inclining northerly it may be necessary to tack, when the clearing marks for the shoals on either side already mentioned and marked on the plan must be observed. The eastern shore within Lighthouse Ledge is clear of danger beyond the distance of 200 yards.

Sailing vessels in leaving the bay will generally have the wind scant in casting. Be careful to keep near the eastern shore until the vessel can weather all the shoals. The morning is the best time for leaving, as the wind inclines northerly, and a vessel may clear in one stretch.

**SCARBOROUGH** ( $11^\circ 11' N.$ ,  $60^\circ 44' W.$ , H. O. Chart 355), the principal town in Tobago, is situated on the northwestern slope of Fort George Hill at the head of Rockly Bay; it is not conspicuous until a vessel arrives at the upper part of the bay. This town is the only port of entry on the island. It has a population of about 2,600.

**Landing pier.**—From the wharf at Scarborough lower town a wooden landing pier projects about 75 feet, with a depth of 6 feet (1.8 m.) at its outer end; there is a crane on the pier capable of lifting 2 to 3 tons.

**Supplies.**—Water is led to the end of the pier by a pipe, but vessels must use their own resources to get it aboard. Small supplies of provisions are obtainable.

**Communication.**—There is mail communication by a Government vessel every week.

Radio communication is established with Trinidad.

**South coast** ( $11^{\circ} 08' N.$ ,  $60^{\circ} 47' W.$ , *H. O. Chart 1618*)—**Columbus and Crown Points.**—Columbus Point, the southern extremity of Tobago Island, is low and skirted by a reef to a distance of 100 yards, with a depth of 5 fathoms (9.1 m.) at about 600 yards off, but between it and Crown or Browns Point, the western extremity of the island, shallow water extends 1 mile offshore. Westward of Crown Point the water rapidly deepens.

**Drew Bank**, lying off the southwestern extremity of Tobago, is within the depth of 10 fathoms (18.3 m.), 5 miles in length by about 2 miles in breadth, with general depths of 4 to 8 fathoms (7.3 to 14.6 m.); but there are two dangerous shoals on it, the Wasp at the northern extremity and the Drew at 1 mile within its southwestern extremity.

**Wasp Shoal**, with a least depth of  $2\frac{3}{4}$  fathoms (5.0 m.) over its northern end, lies 2 miles  $210^{\circ}$  from Crown Point, and Pigeon Point, a little open of Sandy Point, leads over Wasp Shoal; the passage between is deep, but as there is no suitable leading mark vessels of greater draft than 15 feet (4.6 m.) are not recommended to use it.

Columbus Point, bearing  $63^{\circ}$ , leads southward of Wasp Shoal, but only just northward of Drew Shoal.

**Drew Shoal**, with  $3\frac{1}{2}$  fathoms (6.4 m.) least water, near the western edge of Drew Bank,  $5\frac{3}{4}$  miles,  $222^{\circ}$  from Crown Point, is a danger to large vessels passing between Tobago and Trinidad, but there is generally a ripple at its edge. There are no good marks on Tobago to be recognized by a stranger for leading southward of Drew Bank, a plain direction being to keep midway between the islands; and when Galera Point, the northeastern extremity of Trinidad, bears eastward of  $168^{\circ}$ , a vessel may haul up if proceeding northward.

**TRINIDAD ISLAND** (*H. O. Chart 1005*), between latitude  $10^{\circ} 04'$  and  $10^{\circ} 57' N.$  and longitude  $60^{\circ} 54'$  and  $61^{\circ} 56' W.$ , was discovered by Columbus in 1498 on his third voyage, and the island received its name from having presented the appearance of three mountains when first sighted. These hills are now known as Trinity Hills, and are situated on Galeota Point, the southeastern extremity of the island. It became a British colony in 1797 and has proved a valuable possession.

The estimated population in 1926 was 387,470.

**Aspect.**—This island is about 42 miles in length, north and south, by about 28 miles in breadth, and contains an area of about 1,800 square miles. Its shores are so straight that it possesses no indentation that forms a harbor for large vessels; there are, however, several anchorages on the western side which, from the absence of hurricanes and the regularity of the breezes, are always safe.

The northern side of the island is marked by a ridge of densely wooded mountains about 8 or 10 miles in breadth, varying from 1,500 to 3,000 feet (457.2 to 914.4 m.) in height. The loftiest summits are Mount Maracas, in the Maracas Ridge, 15 miles from the western extremity of the island, and Mount Aripo, 21 miles from the north-eastern extremity of Trinidad; each is 3,100 feet (944.8 m.) in elevation. To the southward of this range the interior is generally low and flat, with a few isolated hills from 700 to 1,100 feet high (213.4 to 335.3 m.).

The southern side of the island is also bordered by a range of mountains, but considerably inferior in height to those on the northern side; the Trinity Hills, 1,070 feet (326.1 m.) in height, near the southeastern extremity, are the highest. All the western coast of Trinidad is low, excepting Naparima Hill, 591 feet (180.1 m.) in height, close within the town of San Fernando; in clear weather it may be seen from a distance of about 20 miles, and is a good mark when in the Gulf of Paria. The summit of the Montserrat Range, 950 feet (289.6 m.) in height, lies about 8 miles northeastward of it. The main watercourses are of no use for navigation.

**The capital.**—Trinidad (with Tobago) has always been governed as a Crown colony. The governor is assisted by an executive council of 7 members, and the legislative council over which he presides contains 19 members in addition to himself.

Port of Spain, the principal anchorage, the seat of government, and the trade center of Trinidad, is situated on the western side of the island, in the northeast corner of the Gulf of Paria. It is fronted by shallow mud flats, necessitating vessels of deep draft anchoring about 3 miles from the shore.

**Communication.**—There are 81 miles of railroads in the island, and small steamers ply three times a week between the various ports in the island.

There is frequent communication with the United Kingdom, France, Amsterdam, Madeira, Canada, Bermuda, the United States, ports of the Gulf of Mexico, Port Limon, Colon, the West Indian Islands, South America, and Calcutta; steamers also run to Tenerife, to Mediterranean ports, and to Sweden.

There is telegraphic communication between the capital, by submarine cable, and British Guiana, Grenada, Jamaica, and St. Croix, thence via New York, or Bermuda and Halifax, to Europe.

Trinidad is now the headquarters of the Royal Mail Steam Packet Co. in the West Indies.

**Gulf of Paria.**—This gulf is bounded by Trinidad on the east and north and by the mainland of South America on all other sides. Its greatest length east and west is 90 miles and its breadth north and

south 40 miles. It is entered by sailing vessels from the northward by the Dragons Mouth (Bocas de Dragos) during the dry season, from November to June, when the wind blows from northeast to east-northeast, and, if acquainted, from the southward by the Serpents Mouth in the wet season, or from July to November, when the wind is generally from near east-southeast to southeast.

Port of Spain carries on commerce with the interior of Cumana by means of the San Juan and Caribe Rivers, and the town of Guiria, which is on the northwestern shore of the gulf.

The water in the Gulf of Paria and for several miles outside the Bocas has a dirty hue; in the month of October it has a reddish tinge.

**Climate.**—Though the climate of Trinidad is generally described as trying, it is never as oppressive as is that of many tropical countries. The temperature in the shade never reaches 100°, and in private houses seldom reaches 90°.

For three months in the year, January to March, it constantly falls below 70° at night, even at Port of Spain, and the climate is then delightful. Ordinary fevers are prevalent at all times, but more so after the autumnal rains. The mean temperature of the island is 79.3°; the means for February and May, the coldest and hottest months, are at the Botanic Gardens at St. Ann, 67° and 92.3°, respectively. The average annual rainfall is about 70 inches. There has been a continual diminution in the quantity of rainfall. Some rain falls in every month in the year, but the bulk falls in July, August, and September. (See Meteorological Tables, Appendix IV.)

**Winds.**—On the eastern coast of Trinidad the trade wind blows from east-southeast to east-northeast, being mostly from the latter direction during the winter months. Under the western side, in the dry season from November to June, when fine, settled weather prevails, the sea breeze sets in about 9 a. m., varying from east to east-northeast, inclining more to the northward in January and February, and continues steady until 5 p. m., when it subsides into a calm or light air till the following morning. In the summer months, although hurricanes rarely reach thus far south, violent squalls rush down, veering from southeast through south to west, and in October they occur almost daily with heavy rain. There is seldom, however, at this period any fall of rain during the night, but a heavy shower without wind generally comes down about half an hour before sunrise.

**Rollers** sometimes occur on the northern side of Trinidad between the months of January and March.

**Approaching Trinidad and Port of Spain—General directions for sailing vessels.**—Sailing vessels in the dry season between November and June, when the trade wind is to the northward



of east, should navigate the northern side of Trinidad and enter the Gulf of Paria by the Boca Grande, or with a commanding breeze from northward of east (not otherwise) may use the Boca de Huevos or Umbrella Channel. In the remaining portion of the year, when light winds to the southward of east and heavy rains prevail, which increase the velocity of the northerly current, it will be more advantageous for coasters acquainted with the channels to navigate southward of the island and through the Serpents Mouth, but it is not recommended for vessels unacquainted with its navigation. Sailing vessels should always leave the gulf by the Dragons Mouth (Bocas de Dragos).

In either case vessels from the eastward should lose no opportunity by night or day of determining their position, in order to ascertain the effects of the current; more especially in the rainy season, when its strength and direction as the island is approached are extremely variable, and the lead should not be neglected.

At about 20 miles eastward of Galera Point there is a depth of about 43 fathoms (78.6 m.), gray sand and shells, and the depth decreases to 25 to 30 fathoms (45.7 to 54.9 m.), sand and shells or stiff dark clay, at 6 miles from the shore. It is observable that the bottom all along the northern shore of Trinidad is of soft mud, and on the eastern side of the island it is generally composed of gravel, coarse sand, or mud. Delaware Bank, of 13 fathoms (23.8 m.), about 32 miles due east of Galera Point; Emerald Shoal, with a least depth of 6 fathoms (11.0 m.), distant  $17\frac{1}{2}$  miles from Galera Point; and Darien Rock, off the eastern coast, are described later on. (See p. 302.)

It will always be prudent for a sailing vessel to keep well to the southward of the intended landfall, for it will at all times be extremely difficult to work back to the southeastward against wind and current. The northern and easternmost mountains of Trinidad may be seen from a distance of 30 or 35 miles, but Galera Point is only made out at about 9 miles. The northern shore of the island is bold-to, and may be skirted at the distance of about 2 miles. On arriving off Macaripe Cove, near the Bocas, should the wind fall light or draw to the southward so that the current in the Bocas could not be overcome, it will be better to bring up with the kedge in 20 or 30 fathoms (36.6 or 54.9 m.), at about a mile from the land, and wait for the breeze and flood tide. If, on the other hand, this point should only be reached just before dark, and a fresh breeze prevail, especially in the season of rollers, it will be better to stand off and on all night under commanding sail to windward of Saut d'Eau Island and wait for the full strength of the breeze on the following day, which generally sets in about noon.

Sailing vessels should not attempt to run through either of the Bocas after sunset, as the wind then generally falls light and becomes variable.

**NORTH COAST—Galera Point** ( $10^{\circ} 50' N.$ ,  $60^{\circ} 54' W.$ , *H. O. Chart 1005*).—The northern side of Trinidad from Galera Point, the northeastern extremity of the island, to Entrada or Mono Point, the northwestern extremity, a distance of about 46 miles, trends nearly west and is bounded by a rocky shore, upon which the surf breaks with such strength as to render landing impossible, except at a very few places and under favorable circumstances. The land near Galera Point is not more than 50 feet (15.2 m.) high, but at about 3 miles to the westward it begins to rise into the great chain of mountains which extends along this side of the island.

**Galera Point Light**, group flashing white, 114 feet (34.7 m.) above high water, visible 17 miles, is exhibited from a white concrete tower 75 feet (22.9 m.) high, on Galera Point. (See Light List.)

**Rock**.—At about  $\frac{1}{2}$  mile eastward of the point there is a rock, awash at low water, upon which the sea always breaks; in passing eastward of the rock, give it a berth of at least 1 mile, as the current sets strongly toward it.

**Toco Bay**.—The coast from Galera Point trends westward for  $1\frac{3}{4}$  miles to Reefs Point and is skirted by a reef which extends 700 yards. To the westward of Reefs Point is Toco Bay, in which there is anchorage in about 9 fathoms (16.5 m.) at  $\frac{1}{2}$  mile offshore, with Reefs Point bearing  $89^{\circ}$ ; it is by no means to be recommended, as a heavy swell rolls in. Close off Toco Point,  $1\frac{1}{2}$  miles westward of Reefs Point, there are some islets or rocks.

**Coast**.—From Toco Bay the shore, which generally rises steeply from the sea, trends westward to the eastern entrance point of Grande Riviere Bay, off which there is an islet or rock.

**Grande Riviere Bay**, about 8 miles westward of Galera Point, affords temporary anchorage in 9 fathoms (16.5 m.), with the eastern entrance point bearing  $89^{\circ}$  and the eastern extremity of the sandy beach at the entrance of the river  $167^{\circ}$ . Coasters find secure anchorage nearer in on the eastern side; there is generally a heavy surf on the beach.

**Grande Riviere**, at the head of the bay, can only be entered by boats. Westward of this river or stream a sandy beach extends about  $\frac{1}{2}$  mile, and off its western extremity are two rocky islets, the outermost lying about 700 yards from the shore. From thence westward to Grand Matelot Point, a distance of 5 miles, the coast is rocky and high, with a few sandy beaches.

**Les Freres Rocks**, about 5 feet (1.5 m.) high, situated about 2 miles westward of Grande Riviere Bay, extend offshore about  $\frac{1}{4}$  mile; within them is Sharks River, only available for boats.

**Grand Matelot Bank**, with depths of 9 to 10 fathoms (16.5 to 18.3 m.) and from 11 to 12 fathoms (20.1 to 21.9 m.) around, extends 3 miles northward of Grand Matelot Point; anchorage may be taken on it, but the confused sea renders it uncomfortable.

**Coast.**—Madamas River is a small stream situated  $3\frac{1}{2}$  miles westward of Grand Matelot Point. At about  $1\frac{1}{4}$  miles beyond is Trou Bouilli Ris Point, and at 2 miles farther westward is Paria Point, islet, and rivulet, the shore between being chiefly rocky cliffs, with two islets lying near it.

**Rock.**—At 700 yards off the eastern point of Blanchisseuse Bay, situated 3 miles westward of Paria Point, is a rock which uncovers; it is the most outlying danger on this part of the coast.

**The Yarra**, a small stream available for boats, enters the sea at about 3 miles westward of Blanchisseuse Bay. Eastward of the Yarra the shore is partly composed of cliffs, but to the westward it is sandy for about 1,500 yards.

**Chupara Point**, 450 feet (137.2 m.) in height, and 1 mile westward of the Yarra, is steep and bold, and forms the most prominent headland on the northern coast. From its eastern part the Chupara Rocks extend 800 yards northeastward, and from its western extremity a reef extends 600 yards  $245^\circ$  and generally breaks.

**Anchorage** may be obtained anywhere between Chupara Point and Grand Matelot Point in 10 to 12 fathoms (18.3 to 21.9 m.) mud; there is also anchorage in Chupara Bay westward of Chupara Point and sheltered by that point, but it is not recommended.

**Las Cuevas Bay** lies 2 miles westward of Chupara Bay and affords anchorage with Abercromby, its eastern point, bearing  $65^\circ$  distant 600 yards, but it is exposed to the prevailing northerly swell.

**Maracas Bay**, 2 miles westward of Las Cuevas Bay, is 1 mile wide and about the same in depth, with 16 fathoms (29.3 m.) mud at its entrance, gradually decreasing to 9 and 5 fathoms (16.5 and 9.1 m.) toward its head. Although open to the north, it affords better shelter in its southeastern corner than any other anchorage on this coast, but being under high land the winds experienced are very variable. Water, wood, and fish can be obtained here.

**Tides.**—It is high water, full and change, at Maracas Bay at 3h. 30m.; mean high water springs are 5 feet (1.5 m.).

**Balata Bay**, separated from Maracas Bay by Long Point, is about  $\frac{1}{2}$  mile wide and has the same depth. It is more exposed than Maracas Bay.

**La Vache Bay** lies 3 miles westward of Maracas Bay. It does not afford safe anchorage. Off the eastern entrance point of La Vache Bay is an islet of the same name 180 feet (54.9 m.) in height.

**Mal d'Estomac Bay**, situated immediately westward of La Vache Bay, is unfit for anchorage.

**Saut d'Eau Cove** ( $10^{\circ} 45' N.$ ,  $61^{\circ} 30' W.$ ; *H. O. Chart 1005*), about 2 miles westward of La Vache Bay, takes its name from a remarkable cascade which falls over the rocks from a considerable height. Neither this nor La Vache Bay affords safe anchorage on account of the heavy swell which rolls into them and the uncertain winds from the highlands. On the sandy shore of Saut d'Eau Cove there are a few fishermen's huts, and Mount Mal d'Estomac rises abruptly from the shore to the height of 2,230 feet (679.7 m.). Off the cove is Saut d'Eau, a wooded islet 370 feet (112.8 m.) high, steep-to, with a channel between it and the island  $\frac{1}{2}$  mile wide.

**Coast—Signal station** ( $10^{\circ} 45' N.$ ,  $61^{\circ} 34' W.$ ; *H. O. Chart 1964*).—At about 3 miles westward of Saut d'Eau Islet there is a signal staff on a hill 740 feet (225.6 m.) high, known as North Post, which communicates with Port of Spain; at about 3 miles farther to the westward is Corozal Point. The whole shore is bold and rocky, without any shelter whatever.

**Radio**.—There is a radio station at North Post. See International List of Radiotelegraph Stations.

**From Corozal Point** the shore trends southwestward about 4 miles to Entrada or Mono Point, the northwestern extremity of Trinidad.

**Macaripe Cove**, situated 1 mile southwestward of Corozal Point, affords slight shelter for coasters in 3 to 7 fathoms (5.5 to 12.8 m.) of water. At about 30 yards northward of the northeastern point is a sunken rock. In the southwestern part of the cove are two sunken rocks at about 30 yards from the shore and on which the sea breaks when there is any swell.

At change of tide a bore rushes round the cove swinging the ship violently around her anchors. Altogether Macaripe Cove is a most unsafe anchorage.

Fine-weather anchorage in 24 fathoms (43.9 m.) is shown on the chart at  $2\frac{1}{2}$  miles westward of Macaripe Cove.

**Directions**.—Caution is required by large vessels anchoring off here, as there are depths of 14 fathoms (25.6 m.) within 200 yards of the entrance points.

In approaching, steer in with the northeastern point of the cove bearing  $122^{\circ}$  and anchor as soon as the depth of 15 fathoms (27.4 m.) is obtained. A sailing vessel should anchor at least 700 yards offshore in 23 to 25 fathoms (42.1 to 45.7 m.) mud bottom.

**Submarine cables.**—The shore ends of two telegraph cables are laid in Macaripe Cove.

**Water.**—At all the anchorages on the northern shore water may be obtained, but only under very favorable circumstances, on account of the heavy surf which makes landing difficult, more particularly in the months of January and February, when rollers prevail.

**Tides and tidal currents—North coast.**—It is high water, full and change, at Grande Riviere at 4h. 30m.; springs rise about 4 feet (1.2 m). To the eastward of Grande Riviere the tidal current is overcome by the current running to the westward between Trinidad and Tobago. Between Grande Riviere and Chupara Point the last two hours of the ebb, and sometimes the whole of it, sets to the eastward along the shore. To the westward of Chupara the ebb runs always to the eastward, increasing in strength, and diverging to the northeastward and north as Mono Point is approached.

Off the Dragons Mouths the ebb runs to the north and northwestward with a velocity of 2 to 3 knots, according to the season, the strength of the current, and the height of the water in the Orinoco; in the months between July and October its influence is felt at 15 or 20 miles from the land. The flood sets to the westward, decreasing its velocity as it approaches Mono Point and increasing as it recedes from the shore.

**DRAGONS MOUTHS (Bocas de Dragos)—General remarks.**—Entrada Point, the northwestern extremity of Trinidad, is 10½ miles eastward of Penas Point, the easternmost extremity of Paria Province. The space between is divided by three islands (extending halfway across from Entrada Point) into four navigable channels leading into the Gulf of Paria, collectively named by Columbus the Dragons Mouths, from the opposition he met with from the currents and baffling winds in getting through them.

These four passages or channels are called the Bocas Monas, de Huevos, de Navios, and Grande. (See view 23, Appendix V.)

All passages are available for steamers.

Sailing vessels should use the Boca Grande, but under favorable circumstances they may use the Boca de Huevos.

**Tides—Current.**—It is high water, full and change, in the Boca Grande at 3h. 30m., and in Boca Monos about 20 minutes later; springs rise about 4 feet (1.2 m.), neaps 2½ feet (0.8 m.), and this is the average range in all the Bocas and along the western side of Trinidad. The highest tides are in October, the lowest in April and May.

During the summer months, from July to October, the wet season, the flood runs southward through Boca Grande during springs for about four hours, but seldom exceeds  $\frac{1}{2}$  knot, as the northerly current during these months being increased by the vast quantity of water discharged from the Orinoco, swollen by the rains in the interior, is at its maximum. The ebb, accelerated by the current, runs eight hours with a velocity of 2 to 3 knots.

In the dry season, from about November to June, the tidal currents have more effect, as the current is much reduced, but they are always liable to interruption by local causes and the state of the rivers which flow into the Gulf of Paria.

The flood seldom exceeds 1 knot; the ebb and current combined runs from  $2\frac{1}{2}$  to  $3\frac{1}{2}$  knots. In this channel and in the Boca de Huevos the flood current is sensibly felt under the eastern sides of the islands.

The flood current seldom overpowers the normal current, and the ebb current combined with it runs with a velocity of 3 to 4 knots, and even 5 knots, in the rainy season.

It is high water, full and change, in the Boca Monos at 3h. 50m. During the flood there is no tidal current whatever; the ebb combines with the current and runs through to the northward from 2 to 3 knots.

Southward of the Bocas the flood current sets to the eastward along the Trinidad shore, running strongly through Chaguaramas Bay and among the Diego and Five Islands to Port of Spain, when it turns to the southward in the direction of the coast. At Chaguaramas it forces its way in at about two-thirds ebb by the shore very suddenly, checking the ebb, and after a short time subsiding into a steady velocity. From a commanding position the contending currents may be seen producing a strong ripple extending in long curved lines for several miles outside the Bocas, gradually approaching them as the flood current increases. In the Bocas the ripple frequently becomes a violent race and dangerous to small boats.

The ebb current between Port of Spain and the Bocas is stronger than the flood, being increased by the normal northerly current. In the offing to the southward of Gaspar Grande Island both tidal currents run regularly six hours each way, and the rise and fall on the shore follows the general law.

**Boca Grande.**—This channel,  $5\frac{1}{2}$  miles wide, between Chacachacare Island and the coast of Venezuela, is, as the name implies, the largest of the channels leading into the Gulf of Paria, and by far the safest for sailing vessels to navigate, particularly in the summer months, when the tidal currents are strongest and the winds light and variable.

The western shore of Boca Grande, a part of Venezuela, has the following prominent points:

**La Islette** ( $10^{\circ} 45' N.$ ,  $61^{\circ} 52' W.$ ; *H. O. Chart 1005*), 230 feet (70.1 m.) in height, lies off Mexillones Point, its northern extremity.

**A rock**, awash, lies  $\frac{1}{4}$  mile off Penas Point, the eastern extremity of the peninsula. As it always breaks it may easily be avoided.

**Penas Point**.—The little promontory of Penas, forming the northeastern extremity of the coast of Paria, is 980 feet (298.7 m.) high, and nearly separated from the mainland, being connected by a narrow ridge of land at the head of Celeste Bay, about 200 yards in breadth and 250 feet (76.2 m.) high, so that when seen from a certain distance northwestward and southeastward it has the appearance of an island.

**Cariaquita Bay**, about 5 miles to the southwestward of Penas Point, forms a snug anchorage for coasters. In the entrance there are depths of  $3\frac{1}{2}$  to 4 fathoms (6.4 to 7.3 m.) but the current runs across it at times with some strength, rendering it unsuitable for other than small craft. On the western side of the inlet is a settlement and a stream of good water. The mosquitoes are troublesome.

**Goose or Patos Island**, which belongs to Great Britain, is 1 mile in length, east and west, 700 yards in breadth, and 350 feet (106.7 m.) high. It lies  $5\frac{1}{2}$  miles southward from Penas Point,  $2\frac{1}{2}$  miles from the shore abreast, and is steep-to on all sides.

**Diamond Rock** ( $10^{\circ} 40' N.$ ,  $61^{\circ} 46' W.$ , *H. O. Chart 1964*), on the eastern side of the Boca Grande, is about 100 yards in extent, and composed of large blocks of coral, over which there is a depth of  $1\frac{1}{2}$  fathoms (2.7 m.) at low water. The rock is steep-to, and between it and Southwest Rock, at the extremity of Chacachacare Island, distant about 600 yards, there is a depth of 12 fathoms (21.9 m.); this channel is about 300 yards wide, but by no means safe on account of the strong tidal eddies and baffling winds.

**A bell buoy**, painted red, is moored in 9 fathoms (16.5 m.) of water, about 50 yards westward of Diamond Rock, with Southwest Rock  $90^{\circ}$ , distant 700 yards.

Cabres (Cabresse) Islet, bearing  $42^{\circ}$ , leads westward of Diamond Rock; and Romain Point, well open southward of Southwest Rock, bearing  $82^{\circ}$ , leads southward of that danger.

**Chacachacare Island**, the westernmost in the Dragons Mouths, is irregularly shaped, and the northern part is nearly separated from the southern, being only connected by a low neck of sand.

From La Lue Point the coast trends westward for  $\frac{1}{2}$  mile to Cabres (Cabresse) Point, and about midway, at 200 yards from the shore, is Cabres Islet, 135 feet (41.1 m.) high and steep-to.

Near the middle of the western side, abreast the narrow neck of sand that connects the two portions of the island, is La Tinta Bay, skirted by rocks to the distance of 200 yards, and with a patch of  $2\frac{1}{2}$  fathoms (4.6 m.) in its northern part.

The southwestern extremity of the island is terminated by a bold perpendicular cliff 430 feet (131.1 m.) high, facing the west, and gradually sloping southward to the sea. Close to it are two rocky islets lying about 200 yards distant north and south of each other; the northernmost is known as La Fragua, and at 200 yards to the westward of it there is a rock with  $2\frac{1}{4}$  fathoms (4.1 m.) of water; the southernmost is Southwest Rock, 24 feet (7.3 m.) in height.

The northeastern side of Chacachacare Island, between Gime and La Lue Points, rises abruptly from the sea to the height of from 600 to 830 feet (182.9 to 253.0 m.), and at the latter point is composed of remarkable red cliffs.

**Chacachacare Light**, a flashing white light, 825 feet (251.5 m.) above high water, visible 30 miles, is exhibited from a white concrete tower 50 feet (15.2 m.) high, on the northern part of Chacachacare Island. (See Light List.)

**Anchorage.**—The two parts form a large bight on the eastern side named Chacachacare Harbor, open to the southeastward; it is about 1 mile deep by  $\frac{1}{2}$  mile wide, entirely free from danger, and affording good anchorage for large vessels in 15 to 20 fathoms (27.4 to 36.6 m.).

When approaching this anchorage keep toward Romain Point, the southeastern extremity of the island, until within the line of the entrance points, as the current set strong to the northeastward across the entrance.

The southern side of the island is clear of danger, but affords no safe anchorage for sailing vessels.

The leper settlement is situated on Chacachacare Island.

**Directions—Boca Grande.**—No directions are required for steamers using the Boca Grande, except to keep  $\frac{1}{2}$  mile or more offshore.

Sailing vessels entering the Gulf of Paria by the Boca Grande should keep toward Chacachacare Island, taking care, however, not to come within the influence of the baffling winds under the high land, which will probably be felt within the distance of  $\frac{1}{2}$  mile. If a vessel has to work in, the Paria shore of Venezuela should be given a wide berth, as the northerly current sets strongly toward it, and there is no safe anchorage.

The only danger is Diamond Rock, marked by a bell buoy, at the southwestern extremity of Chacachacare, which will be avoided by



observing the danger bearings whence a course may be shaped to the eastward for Port of Spain.

Vessels from Port of Spain running out through the Boca Grande with light winds must be careful to give Chacachacare Island a berth of about  $1\frac{1}{2}$  miles until Cabres Island is open westward of Cabres Point, which leads westward of Diamond Rock, when a fair-way course may be shaped, taking care, however, to keep well clear of the Paria shore.

**Boca de Navios (Ship Channel)**, between Huevos and Chacachacare Islands, is about 1,300 yards wide at its narrowest point, and free from danger, being in some places 100 fathoms (182.9 m.) deep; but as the wind will seldom allow a sailing vessel to lay up as high as  $135^{\circ}$ , the course through it is not a safe entrance to the gulf. It may, however, be freely navigated from the southward with a steady commanding breeze, and under the circumstances it is far safer than the Huevos; but if the wind be light and variable it will be more prudent to run through the Boca Grande, for there is no safe anchorage, and the current sets toward Chacachacare Island.

**Huevos or Egg Island**, the center and smallest of the group in the Bocas de Dragos, is uninhabited and lies about 1,800 yards eastward of Chacachacare Island. It is of a semicircular form, convex to the northeastward, about  $1\frac{1}{2}$  miles in length, but very narrow; near the middle it is almost divided into two parts, being only connected by a small neck of sand, named Haulover (Buia Sin Entrada), which covers at high water. The northeastern extremity, the most elevated part, is 680 feet (207.3 m.) high, and close off it there is an islet 90 feet (27.4 m.) high, steep-to, known as the Quitasol or Umbrella Rock. Although a bay is formed on the western side of Huevos Island free from rocks, the water is deep and it does not afford safe anchorage.

**Boca de Huevos**, sometimes known as Umbrella Channel, is about 1,500 yards wide, and, lying northeast and southwest, is usually taken by sailing vessels entering the Gulf of Paria, and something will be gained to windward as well as the saving of distance. It requires, however, a commanding breeze from the northward of east, sufficient to give a speed of 5 or 6 knots, to enable a sailing vessel to stem the current, more especially during ebb tide, which increases the current.

When running in Huevos Island should be kept close aboard to avoid the eddies, baffling winds, and calms under Monos Islands, where a vessel is liable to become unmanageable and the current either sweep her out again or drift her on the rocks, for the water is too deep for anchoring. With the wind to the southward of east, or light, it should not be attempted, and in case of doubt it is advis-

able for a sailing vessel, more especially if square-rigged, to use the Boca Grande.

A bank, with a depth of 12 fathoms (21.8 m.), about 400 to 600 yards in extent, lies 900 yards,  $160^{\circ}$  from the southwestern extremity of Huevos Island.

**Monos or Monkey Island**, the easternmost island in the Bocas, is 1,000 feet (304.8 m.) in elevation, about 2 miles in length northeast and southwest, by  $1\frac{1}{2}$  miles in breadth. It has a ridge along its northern and western side which sends off singularly sharp spurs to the various points on the southeastern side, and on the northwestern side terminates in bold cliffs from 700 to 800 feet (213.4 to 243.8 m.) in height. The inhabitants on it have to depend upon rain for a supply of water.

Anchorage for small craft will be found in Dehert Bay, on the southeastern side of the island. From the eastern entrance point of Pierre or Coxall Bay, in the eastern approach to Dehert Bay, a ledge with 8 feet (2.4 m.) of water extends southward about 200 yards.

**Boca Monos.**—This channel lies between Monos Island and Trinidad and is from 400 to 800 yards wide with a depth of 21 to 47 fathoms (38.4 to 86.0 m.), muddy bottom; the eddies experienced off the points are so strong and irregular and the wind so baffling under the high land of Trinidad—although a fine steady breeze may be blowing outside—that it is by no means adapted for a sailing vessel. Steamers have only to keep in mid-channel.

**Caution.**—This passage should not be used by low-powered steamers.

**Puercos Rocks.**—At 200 yards  $65^{\circ}$  from the northeasterly extremity of Monos Island are Puercos Rocks, the largest of which is 70 feet (21.3 m.) high, with shallow water between them and the island. Shallow water extends a short distance off the rocks at the northern point of Scotland Bay; Teteron Rock, a small rock, which dries 3 feet (0.9 m.) at low water, lies close off Teteron Point, on the eastern side of the southern entrance, and there is a small ledge close off the opposite point on Monos Island, but they can scarcely be termed dangers.

**Scotland Bay (Carenage de Monos).**—From Monos or Entrada Point, the northeastern point of entrance to Boca Monos and the northwestern extremity of Trinidad, the coast trends southward for about 1,500 yards to the entrance of Scotland Bay, formerly known as Carenage de Monos, about  $\frac{1}{2}$  mile wide at the outer part by the same distance in length. At the entrance there is a depth of 18 fathoms (32.9 m.), which decreases to 6 and 5 fathoms (11.0 and 9.1 m.) at the inner part, where a vessel of moderate draft might be secured to the shore in safety. Off the sandy beach on the eastern

side there is a bank which shoals suddenly; therefore in beating up, the northern shore, which is fairly steep-to, must be kept aboard.

Scotland Bay affords useful anchorage for steamers in cases of necessity, in about 11 fathoms (20.1 m.), mud and sand.

**Teteron Bay** is situated about 1,500 yards southward of Scotland Bay, with 15 fathoms (27.4 m.) at its entrance, decreasing to 8 fathoms (14.6 m.) within 200 yards of the beach. At about 100 yards from Teteron Point is a small rock which dries 3 feet (0.9 m.). The land at the back of these bays rises to the height of 1,500 feet (457.2 m.).

**GULF OF PARIA.**—**Gaspar Grande Island**, distant 1 mile southward from Teteron Point, is about  $1\frac{1}{4}$  miles in length, east and west,  $\frac{1}{2}$  mile in breadth, and 360 feet (109.7 m.) high. There are a few inhabitants on its southern side scattered along the shore of a deep cove, known as Corsair Bay, which forms a good boat harbor, but the place is not considered healthful. Water, food, stock, vegetables, and fire wood may be obtained at Corsair Bay by permission of the owner.

**Scorpion Ledge**, with 10 feet (3.0 m.) of water, extends 250 yards from the southeastern extremity of the island, and from its outer edge bears  $194^{\circ}$  from Reyna Point, the northeastern extremity of the island.

**Gasparillo Island** ( $10^{\circ} 40' N.$ ,  $61^{\circ} 39' W.$ ; *H. O. Chart 1964*) lies to the northward of Gaspar Grande Island, at 250 yards off San Jose Point. It is 120 feet (36.6 m.) high and has a small rock off its northern side, leaving a narrow channel between the rock and San Jose Point with  $5\frac{1}{2}$  fathoms (10.1 m.) of water.

**Chaguaramas Bay.**—From Teteron Point the coast trends eastward nearly 1 mile to San Jose Point, the western point of Chaguaramas Bay. This bay, being about 1 mile across and sheltered by Gaspar Grande Island, affords excellent anchorage in every part. The only obstruction is a flat sand bank with less than 6 feet (1.8 m.) of water, steep-to, extending about 600 yards from the northern side of the bight between San Jose Point and the narrow neck of land which separates the bay from the Carenage on the eastern side of the peninsula. This will be avoided by keeping Teteron Point open of San Jose Point. The channel between San Carlos, the eastern point of the bay, and Gaspar Grande Island is  $\frac{1}{2}$  mile wide, and the only danger is Scorpion Ledge, at the southeastern extremity of Gaspar Grande Island, before mentioned.

**Floating dock.**—The Government has a floating dock moored in the eastern part of the bay 1,000 yards northward of Point San Carlos. It has been reported that there is shoal water in the ap-

proach to the floating dock. For full description of this dock see page 294.

**Buoys.**—Northward about 400 yards from San Carlos Point is an unnamed point, from which foul ground extends northwestward 200 yards. The outer edge of this foul ground is marked by two buoys.

Two small buoys are placed in 18 feet (5.5 m.) of water, indicating the east edge of a bank westward of the entrance of the floating dock.

A warping buoy is moored about 200 yards southward of the dock.

**A canal** for boats, named Harts Cut, has been cut across the peninsula between Chaguaramas Bay and the Carenage, available at half flood.

**Water** may be obtained in Chaguaramas Bay, and the most convenient anchorage for this purpose will be found in 13 fathoms (23.8 m.) with the eastern extremity of Gaspar Grande Island bearing south and Teteron Point a little open of San Jose Point.

**Directions.**—Steamers may enter Chaguaramas Bay from the northward by the Boca Monos and the channel between Gasparillo and Gaspar Grande Islands, and all that is necessary is to steer in midchannel.

Sailing vessels should enter by the eastern channel, between Gaspar Grande Island and the Chaguaramas Peninsula, and the only precaution necessary is not to bring Reyna Point, the northeastern extremity of Gaspar Grande Island, to bear eastward of north, to avoid Scorpion Ledge, off the southeastern point of that island. It will be better to enter this channel on the flood with a good breeze, which will not only place a vessel more under command, but lessen the risk of drifting upon Gaspar Grande Island should it fall light under the Peninsula of Chaguaramas, which is 480 feet (146.3 m.) high. As the wind is generally from the eastward it will be better to leave the bay by the western channel.

**Escondida Cove**, a short distance to the northward of San Carlos Point, affords anchorage for small coasters.

**Carenage** ( $10^{\circ} 40' N.$ ,  $60^{\circ} 37' W.$ ; *H. O. Chart 2115*).—On the northeastern side of Chaguaramas Peninsula there is an inlet with depths of about 4 fathoms (7.3 m.); at its head is a cover with about 10 feet (3.0 m.) of water, where vessels of light draft can effect repairs with their own resources.

A pole stands near the edge of the 3-fathom (5.5 m.) curve about 1,000 yards north-northeastward of Alice Point, the eastern extremity of the Chaguaramas Peninsula.

**Tides.**—It is high water, full and change, at the Carenage at 4h. 08m.; springs rise about  $3\frac{3}{4}$  feet (1.2 m.). The flood outside runs

with a maximum velocity of about 2 knots to the eastward for 8 hours, commencing at about two-thirds ebb by the shore. This long-continued flood tide will be found advantageous to small vessels working up to Port of Spain.

**Cronstadt and Carrera Islands**, sometimes called **Diego Islands**, 151 feet (46.0 m.) and 167 feet (50.9 m.) high, respectively, are separated by a channel  $\frac{1}{4}$  mile wide, having near the middle a shoal with 11 feet (3.4 m.) of water, whose position on the chart is approximate only with 24 feet (7.3 m.) of water between it and the eastern island. These islands are steep-to, and lie about 700 yards from Chaguaramas Peninsula; in the passage between, there are depths of 90 to 120 feet (27.4 to 36.6 m.).

Cronstadt Island is used by St. Mary's College as a resort for the priests and teachers, while Carrera is the convict establishment of the colony. Both islands have several buildings on them which are conspicuous.

**Five Islands or Las Cotorras**, known locally also as the **Quarantine Islands**, the largest of which, **Caledonia**, is 83 feet (25.3 m.) high, consist really of six islands, though **Craig**, the smallest, is joined to **Caledonia** at low water by a narrow reef.

All these islands are under the control of the Port of Spain Quarantine Board. There are several bungalows on them, those on **Rock** being the most conspicuous on account of the red and white striped roofs.

**Caledonia**, **Craig**, and **Pelican** are resorted to for change of air, bathing, etc. **Lenagan** has a fumigating station and post office on it. **Nelson** is used as the immigration depot for East Indian natives, and **Rock** as a quarantine station.

**Cocorite**.—From the **Carenage** the coast takes an easterly direction for 6 miles to the city of Port of Spain. On the shore between is situated the village of **Cocorite**, where there is a wharf conveniently situated for landing military stores for **St. James Barracks**. The leper hospital is close to the pier.

**PORT OF SPAIN** ( $10^{\circ} 39' N.$ ,  $61^{\circ} 39' W.$ ; *H. O. Chart 2115*), the capital and seat of government of the Crown Colony, Trinidad, and Tobago, is situated in the northeastern part of the Gulf of Paria. It is well sheltered from the prevailing winds, which are from the eastward, and while not a harbor, affords safe anchorage at all seasons. Vessels of deep draft must anchor at a considerable distance from the shore.

**Depths**.—This city is fronted by mud flats, with depths of 60 feet (18.3 m.) 6 miles from the shore. Thence the bottom shoals gradually toward the shore, there being 36 feet (11.0 m.) 4 miles out and 18 feet (5.5 m.) 1 mile offshore.

**Aspect.**—The site of the city is low lying, being situated on the shore at the southern extremity of a low, flat plain at the base of St. Annes Mountains, which rise to a height of 2,140 feet (652.3 m.) about 3 miles northeastward of the city; at  $\frac{1}{2}$  mile to the eastward it is overlooked by La Ventille Hills or Abercomby Heights, a spur from the northern mountains, and on the summit of a small hill, 535 feet (163.1 m.) high, is La Ventille Church. Below it and on the same spur is a conspicuous advertising sign (at times illuminated at night), and still lower, at an elevation of about 410 feet (125.0 m.) is St. David's Tower. This spur terminates at the southeast end of the city and at its base are stone quarries, which are conspicuous by their reddish color. Northwestward of the city is Fort George Signal Station, which is very conspicuous and rises to a height of 1,089 feet (331.9 m.). See view on Hydrographic Office Chart 2115.

**Signal station.**—The signal station, mentioned in the preceding paragraph, communicates with ships in the roadsteads, the city, and with North Post Station, located on the northern side of the island.

**Beacon.**—A tripod beacon with a ball topmark, painted red, marks the edge of the 3-fathom (5.5 m.) curve westward of the low point within which is Caroni River.

**Port of Spain Light,** a group flashing white light, 64 feet (19.5 m.) above high water, visible 10 miles, is exhibited from a white hexagonal tower, 69 feet (21.0 m.) in height, located on the inner end of the old jetty (Kings Wharf). (See Light List.)

**Storm signals** are shown from the harbor master's office, situated near the old jetty. The signal consists of a red flag with a square black center. It is shown upon the receipt of information from the United States Weather Bureau that a storm in the vicinity of Trinidad is indicated.

**Port of Spain Range Lights.**—The front light, a fixed red one, 24 feet (7.3 m.) above high water, visible 6 miles, is exhibited from a wooden post on the new St. Vincent Jetty.

The rear range light, a fixed green light, 54 feet (16.5 m.) above high water, visible 3 miles, is shown from the top of the Columbus Building, 348 yards  $49^\circ$  from the front light. There is also a white triangular day mark in this same position. (See Light List.)

The lights in range led to St. Vincent Jetty in a least depth of 11 feet (3.4 m.). They formerly led through the dredged channel to the jetty, but this channel has silted up until the depths are the same as the other depths in this vicinity.

**Buoys.**—Two red can buoys are moored in 15 feet (4.6 m.), 1,450 yards  $238^\circ$  and 1,400 yards  $234^\circ$  from the front range light. These buoys are apt to drift, and, due to their inconspicuousness, should be approached cautiously at night.

**Pile dolphins.**—About 1,200 yards 305° from the St. Vincent Light there are two pile dolphins, 70 by 20 feet and 6 feet (1.8 m.) high.

**Lights.**—These dolphins are marked by two fixed red lights.

**Mucurapo Light**, a group flashing white light, 32 feet (9.8 m.) above high water, visible 8 miles, is shown from the red roof of the pumping station, which is 31 feet (9.4 m.) in height at Mucurapo Point. The light is visible from 277° through north to 97°. (See Light List.)

**Buoy.**—A red conical buoy is moored in 13 feet (4.0 m.) of water about 600 yards southward from Mucurapo Point.

**Wrecks.**—About 12 sunken coal lighters lie in the area between St. Vincents Jetty and the lighted dolphins, about 1,200 yards north-westward from the jetty.

A wreck lies sunk about 900 yards southward of Mucurapo Light.

**Light buoy.**—A buoy showing a flashing green light is moored in 16 feet (4.9 m.) of water, 1,000 yards southward of Mucurapo Light.

**Hulk.**—A hulk is moored northward of Caroni Beacon.

**Anchorage** can be taken anywhere off the town; the bottom is of soft mud and most vessels will not be damaged by touching, but care must be taken not to ground on the anchors, especially at night, when it is calm; vessels anchoring in their own draft should be steadied with a kedge laid out to the westward. The increase of depth from the shore is very gradual and the 3-fathom (5.5 m.) curve is about 1 mile from the shore. A conspicuous line for steamers to approach on is with the Port of Spain Lighthouse in range with St. Davids Tower, bearing 68°, as there is usually clear anchorage space on or near this range, whereas sailing vessels usually anchor more to the southeastward.

By anchoring with the Port of Spain Lighthouse bearing southward of 65°, a vessel will be away from the foul water discharged from the Caroni Swamp; after heavy rains, however, this water is carried past the anchorage on the turn of the tide at high water, the edge of the discoloration being very marked.

The following conspicuous objects are useful in selecting a berth: A red chimney at the pumping station near Mucurapo Point, a gray chimney 1,200 yards north-northwestward of St. Vincent Jetty, a large square yellowish-colored church tower 800 yards northward of the same jetty, the radio masts, the lighthouse, the ruins of St. Davids Tower, which resembles a white martello tower, the square white church tower on the hill northeastward of St. Davids Tower, and between these two towers there is an advertisement sign consisting of an anchor, which is conspicuous by day and also by night, when it is electrically illuminated intermittently.

Vessels should anchor within 3 miles of the shore if draft permits, otherwise the harbor authorities will not board.

**Oil-loading berth.**—From the shore, about south of Mucurapo Light, an oil pier, consisting of six concrete and iron piles with wooden fenders 25 by 12 feet, and 6 feet (1.8 m.) above high water extends about 300 yards  $182^{\circ}$  to a dolphin. The depth alongside is 12 feet (3.7 m.) at high water.

**Quarantine ground.**—The quarantine ground extends about  $11\frac{1}{2}$  miles southward from Five Islands.

**Tides and tidal currents.**—It is high water, full and change, at Port of Spain at 4h. 08m. mean high-water springs  $3\frac{3}{4}$  feet (1.1 m.); mean high-water neaps 3 feet (0.9 m.). In the summer months the higher tide is during the night, and in the winter months it is during the day.

The flood sweeps round the bay to the southeastward with a velocity of  $\frac{1}{2}$  knot and the ebb to the northwestward with the same velocity. At a distance of 4 miles southwestward of St. Vincent Jetty, the currents have been found to be irregular and of considerable strength.

**Pilots and pilotage.**—Pilot boat is usually stationed at the north entrance to the Gulf of Paria. The signal for a pilot is the customary International Signal.

The pilot boat will fly a flag of two colors, the upper horizontal half white and the lower half red, and have the letters P B on the sail

Pilotage is neither compulsory nor necessary for steamers, but is considered desirable for sailing vessels.

Ships will be piloted in at night, but it is necessary to request the services of a pilot in advance by dispatch.

**Directions.**—After passing Diamond Rock Buoy leave it about  $\frac{1}{2}$  mile to the northward, and make good a course of  $99^{\circ}$ , passing the various small islands at a distance of from 1 to 2 miles. When La Ventille Church, bears  $69^{\circ}$  or the spire of Trinity Church (cathedral) in the town bears  $65^{\circ}$ , or again if at night when St. Vincent Jetty Front Light bears  $70^{\circ}$ , slow down to steerage way and head for either of these marks. Keep the lead going and anchor on the depth desired, allowing for the state of the tide.

La Ventille Church is by far the most conspicuous landmark near Port of Spain and is easily picked up.

**Sailing vessels.**—The navigation from all the Bocas to Port of Spain is so simple that it is only necessary to take advantage of the winds in working up, and to observe that the farther a vessel is to the southward of the Bocas the less will be the current experienced. This should be borne in mind in sailing vessels with light



winds, otherwise they may be drawn into the mouths of the small Bocas by the prevailing northerly current. Should it be found necessary to stand far southward, the soundings will be found not quite regular, there being some small banks with 7 to 9 fathoms (12.8 to 16.5 m.) with 12 to 15 fathoms (21.9 to 27.4 m.) around at about 12 miles from Chacachacare. A depth of 5 fathoms (9.1 m.) will be found about 2 miles off the eastern shore of the gulf, whence it decreases gradually toward it. Anchorage may be taken anywhere.

When abreast Gaspar Grande Island the spires of the two principal churches in the city of Port of Spain will be in sight and serve for guides in working up. La Ventille church bearing to the eastward of 80°, will not be too near the wind for sailing vessels.

**PORT OF SPAIN** (10° 39' N., 61° 39' W.; *H. O. Chart 2115*) is regularly built with wide streets, and it has some fine buildings, among which are the customhouse, market, and numerous churches. It possesses, in the way of shops, electric light, telephones, and clubs, the resources of a modern town. The valley is drained on the eastern side of the city by St. Annes River and on the western by the Maraval, but they are mere mountain streams.

The city has a population of 64,535.

The United States is represented by a consul and a vice consul.

**Port offices.**—The customhouse, harbor master's office, telegraph and storm-signal stations are all situated on the wharves between the lights. There are no port charges except the health fees.

**Wharves.**—St. Vincent's Jetty, about 150 yards in length, extends southwestward from the wharf westward of the customhouse, with depths of 11 feet (3.4 m.) along its outer end at low water.

There are wharves for small craft eastward of the jetty, southern side of the town.

Cargo is handled by lighters from ship to shore. On the St. Vincent Jetty there are two cranes—one of 15 tons and the other of 5 tons. Railroad spurs lead down to the wharf.

There are several small tugs suitable for towing lighters.

**Repairs.**—There is a well-equipped engineering shop capable of making average repairs to hull and machinery of vessels.

**Docks.**—There is a floating dock in Chaguaramas Bay of the following dimensions: Length over all, 365 feet; inside breadth, 56 feet (which can be increased to 65 feet), and a depth over the sill of 18 feet (5.5 m.). It is capable of lifting vessels of 4,000 tons. The floating dock and the machine shop are owned by the Government and are managed by the Director of Public Works. (See Appendix II.)

At Port of Spain there is a small private patent slip with the following dimensions: Extreme length, 159 feet; length of cradle, 71 feet; width of cradle, 18 feet; draft, 4 feet (1.2 m.); and lifting power, 250 tons.

**Supplies.**—Ship chandler, engineering, and commissary supplies can be obtained in any quantity.

Water of excellent quality for both drinking and boiler use can be obtained in unlimited quantities. Water is delivered alongside in water barges, the maximum rate of delivery being about 50 tons per hour.

**Coal.**—Between 5,000 and 6,000 tons of American coal is always on hand. It is delivered alongside in lighters and is put on board at a rate of about 100 tons per hour.

Fuel oil, both bunker and Diesel, is available in unlimited quantities. It is delivered alongside in oil barges at Port of Spain or by means of pipe lines, if the vessel proceeds to Pointe-a-Pierre. It is native oil. Gasoline is also delivered in bulk.

**Communications.**—There is telegraphic communication between the capital, by submarine cable, and British Guiana, Grenada, Jamaica, and St. Croix, thence via New York, or Bermuda and Halifax, to Europe.

Trinidad is now the headquarters of the Royal Mail Steam Packet Co. in the West Indies.

There is frequent communication with the United Kingdom, France, Amsterdam, Madeira, Canada, Bermuda, the United States, ports of the Gulf of Mexico, Port Limon, Colon, the West Indian Islands, South America, and Calcutta; steamers also run to Tenerife to Mediterranean ports, and to Sweden.

**Radio.**—There is radio communication with Tobago and British Guiana. Merchant vessels in the harbor are subject to certain governmental regulations concerning the use of their radio apparatus. These regulations are constantly changing, and masters and others concerned are cautioned to obtain the latest information from the local authorities.

The station is Government owned, and handles commercial messages. Call letters VPL.

**The sanitary condition of the city is excellent.**

**Hospital.**—There is a good Government hospital, named the Colonial Hospital.

**Quarantine regulations.**—Every vessel in quarantine must have a yellow quarantine flag flying at her foretruck by day and a quarantine light (a bright light visible 1 mile) in the same position by night.

**West coast** (*H. O. Chart 1005*).—From Port of Spain the coast, low and swampy, trends southward for about 14 miles to Cangrejos Tree and Point, fronted by a mud flat with depths of less than 3 fathoms (5.5 m.) at a distance of from  $1\frac{1}{2}$  to 2 miles.

The Caroni, Blue, Chagouane, and Couva streams formerly discharged their waters through this district, but they are all apparently blocked by the growth of the foreshore.

**Bank.**—A bank with depths of 7 to 10 fathoms (12.8 to 18.3 m.), with its apex on the parallel of Barrancones Point, extends about 16 miles to the westward of this coast, with a patch of 7 fathoms (12.8 m.) near its western extremity. There are also isolated patches of 7 to 10 fathoms (12.8 to 18.3 m.) for many miles westward of it. This bank affords convenient anchorage.

**Barrancones Point** ( $10^{\circ} 31' N.$ ,  $61^{\circ} 28' W.$ ) is a low point situated 8 miles southward of Port of Spain; between it and Cangrejos Tree, 6 miles beyond, are several sugar estates. A few small cliffs show through the mangrove trees, and a long building, Felicity Hall, is seen at about 2 miles north of Cangrejos Tree. The depth of 3 fathoms (5.5 m.) is nearly 2 miles offshore in this vicinity.

**Cangrejos Point** may possibly be recognized by a large banyan tree northeastward of it.

There are two chimneys, one  $1\frac{1}{2}$  miles northeastward and the other 2 miles eastward of Cangrejos Point and a little back of Savaneta Point.

**Mud flat.**—The coast between Cascaal Point and Cangrejos Point, about  $1\frac{1}{2}$  miles northward of it, has grown out considerably, the low-water line being  $1\frac{1}{2}$  miles seaward of the tree. A flat with depths of less than 5 fathoms (9.1 m.) extends  $2\frac{1}{4}$  miles westward of the banyan tree.

**Buoy.**—A red conical buoy lies near the western edge of this flat.

**Claxton Bay** ( $10^{\circ} 20' N.$ ,  $61^{\circ} 28' W.$ ; *H. O. Chart 135*) is situated between Lisas and Pointe-a-Pierre, and from its shore a bank

with depths under 18 feet (5.5 m.) extends 1,500 yards. At the northern end of the bay is a small pier used for loading sugar, and about 1,400 yards to the southward, distant 1,700 yards from the shore, is a loading stage for petroleum, 200 feet long, supported on two dolphins, with depth of 25 feet (7.6 m.) alongside. There are warping buoys alongside.

This installation belongs to the Trinidad Central Oilfields. The total capacity is about 14,500 tons, and 100 tons of oil can be delivered per hour.

**Pointe-a-Pierre**, about 5 miles southward of Cangrejo banyan tree, is the western termination of the range of hills which extends nearly across the middle part of Trinidad.

**Pierre Shoal**, composed of mud and sand over a moderately hard pitchy substance, has a least depth of 22 feet (6.7 m.) situated  $1\frac{1}{2}$  miles west-southwestward of Pointe-a-Pierre.

Between Pointe-a-Pierre and San Fernando are the streams Tarouba and Guaracara, with banks off their mouths, dry at low water; the Farallon, a rock 15 feet (4.6 m.) high, bearing south, leads westward of Guaracara Bank and the shore flats in not less than 3 fathoms (5.5 m.).

**Oil-loading stage and pipe-line viaduct.**—A pipe-line viaduct has been laid from the extremity of the point about 400 yards south-eastward of Pointe-a-Pierre in a  $256^\circ$  direction for a distance of 1,850 yards. At the outer end of this viaduct there is an oil-loading stage.

There are two mooring buoys about 100 yards northward of the oil-loading stage. Arrangements for oiling at the stage, and inquiries as to permissible draft of water should be made at Port of Spain; an occasional light will be exhibited, by arrangement, from the outer end of the stage. As a rule, weather conditions permitting, it is preferred that vessels should go along the northern side of the stage and if possible avoid using an anchor. There is a least depth of 25 feet (7.6 m.) alongside the loading stage.

Vessels unable to use the jetty can be oiled from lighters, of which there are two, each of 200-ton capacity.

**Caution.**—It is reported that there is less water than is charted at the southern berth of the oil-loading jetty.

**Landmark.**—The red oil tank, surrounded by smaller tanks and with three small black inconspicuous chimneys close southward of it, on the hill northeastward of the viaduct is a good mark to pick up.

**Caution.**—On account of the position of Pierre Shoal, also other shoal depths of from 21 to 25 feet (6.4 to 7.6 m.) within 400 yards southwestward of the jetty, vessels of moderate draft should approach the pier with it bearing more than  $75^\circ$ .

**Currents.**—Off the jetty the flood current sets southward and the ebb current northward at the rate of  $\frac{1}{2}$  to 1 knot. In the offing, outside the 10 fathom (18.3 m.) curve, the currents due to the tides are not well defined; during July-August, 1924, a southwesterly current was experienced running for several days on end, and at other times little or no current either way.

**SAN FERNANDO** ( $10^{\circ} 16' N.$ ,  $61^{\circ} 28' W.$ ; *H. O. Chart 135*).—This town, situated about 22 miles southward of Port of Spain, is well marked by Naparima Hill, 591 feet (180.1 m.) in height, which rises behind it; this hill may be seen in clear weather from a distance of 24 miles, and is a useful mark to vessels standing southeastward from the Bocas. When within a distance of 3 miles from seaward the Roman Catholic Church is conspicuous. (See view on *H. O. Chart 135*.)

**Dangers.**—**Oropuche Bank**, extending from the coast between San Fernando and Pitch Point, slopes down gradually from the shore with depths of under 12 feet (3.7 m.) to its northern extreme which lies about 5 miles westward of San Fernando Pier.

**Pitch Shoal**, a small shoal with a least depth of 23 feet (7.0 m.), lies about 3 miles west-southwestward of the pier.

**Buoy.**—A red conical buoy marks the northern extremity of Oropuche Bank.

**Hughes Rock**, about  $1\frac{3}{4}$  miles west-southwestward of the pier, is a small pinnacle rock, with 4 feet (1.2 m.) of water on it, rising from a pitch bank.

**Beacon.**—The rock is marked by an iron tripod beacon with triangular top mark, base up, painted red.

**A reef**, which dries, extends about 400 yards from Bontour Point, a rocky point just southward of San Fernando; on this reef are the remains of several concrete piles, about 2 feet (0.6 m.) high.

**Farallon Rock**, 1,600 yards westward of Bontour Point, is 15 feet (4.6 m.) high; 1,100 yards westward of it is an 8-foot (2.4 m.) shoal.

**San Fernando Light**, fixed white, 24 feet (7.3 m.) above high water, visible 3 miles, is exhibited from a mast on the outer end of the pier. This light in 1928 was reported unreliable and when showing could not be distinguished from the other lights on the pier.

**Buoy.**—A black can buoy is moored in 8 feet (2.4 m.) of water about 1,600 yards west-northwestward of San Fernando Pier and is used as a rounding buoy by small craft proceeding to the northward from San Fernando or coming from the northward to San Fernando.

**Anchorage** can be taken in accordance with draft off San Fernando, in depths of from 48 to 24 feet (14.6 to 7.3 m.) at distances up to  $2\frac{1}{2}$  miles from the pier with the summit of Naparima Hill bearing  $107^{\circ}$ .

**Tides.**—In the bight of San Fernando the currents are scarcely perceptible, and here it is high water, full and change, at 4h. 38m., springs rising 5 feet (1.5 m.) and neaps 3 feet (0.9 m.). Between La Brea and Cedros Points the flood current sets southwest and the ebb northeast with the velocity of 1 to 2 knots.

**Pilots.**—See Port of Spain (p. 293.)

**Directions.**—The conspicuous oil tank on Pointe-a-Pierre in range with the southeast shoulder of Montserrat Hills, bearing  $71^{\circ}$ , leads northwestward of Oropuche Bank. Naparima Hill, bearing  $107^{\circ}$ , leads northeastward of Oropuche Bank and to the anchorage.

**SAN FERNANDO** ( $10^{\circ} 16' N.$ ,  $61^{\circ} 28' W.$ , *H. O. Chart 135*) is the second most important town in Trinidad. It has an estimated population of 10,160 and is regularly built.

**Wharf.**—There is a reinforced-concrete pier, 450 feet long, which has a least depth of 3 feet (0.9 m.) alongside on its northern side and 2 feet (0.6 m.) on the south side.

The railroad which connects San Fernando and Port of Spain has tracks on the pier.

Vessels loading sugar should first obtain stevedores at Port of Spain. These stevedores remain on board during the entire time taken to load and are then taken back to Port of Spain. Sugar is loaded at the anchorage from sailing lighters, capable of carrying about 29 tons of sugar. As these lighters can only cross the bar to the River Cipero, where they are loaded, at high water, they must be unloaded most expeditiously in order not to lose a tide.

Supplies of all kinds can be obtained at Port of Spain.

Water in San Fernando is good for boiler purposes; there is a 2-inch pipe at the customs. There are two hydrants on the pier for the use of the railroad steamers. Water for ships must be taken off in barrels. Drinking water can not be obtained.

**Hospital.**—There is a municipal hospital at San Fernando.

**Oropuche Lagoon.**—At 4 miles southwestward of San Fernando is Godineaus River, the entrance to Oropuche Lagoon. This large swamp, 12 miles in length by 3 miles in width, renders the adjacent country very unhealthy. It is gradually silting up and now is being reclaimed.

**La Brea Point** ( $10^{\circ} 15' N.$ ,  $61^{\circ} 38' W.$ , *H. O. Chart 135*), situated 25 miles southward from Port of Spain, is prominent and remarkable for the celebrated pitch lake in the vicinity.

**La Brea and Brighton.**—There are two villages on La Brea Point; the eastern one is La Brea and the western one Brighton, the pier at which is brilliantly illuminated at night by powerful electric lights, which enable Brighton to be seen from almost any part of the Gulf of Paria.

The following objects are conspicuous from the offing: Yellow and red chimneys in La Brea village, a yellow corrugated-iron chapel with a red roof situated between La Brea village and Brighton

Pier, a flagstaff standing on the slope of the hill behind Brighton Pier, and a black chimney with a row of tall chimneys behind it situated on the summit of the hill.

**Pitch Lake** is a vast deposit of bituminous matter, 114 acres in extent and 140 feet (42.7 m.) above sea level.

The surface is now bare of vegetation and hard enough to bear foot traffic and carts, while, by the aid of a sort of corduroy road made of wood, it supports an overhead transporter. The pitch is dug out and packed in barrels, which are conveyed by the transporter to Brighton Pier, whence it is shipped. Almost as fast as the pitch is dug out fresh material works itself in by natural pressure from the sides and from below. Numerous trunks of trees, 4 to 6 inches in diameter, are thrust up end on, and stand up 2 or 3 feet (0.6 to 0.9 m.) above the surface of the lake; they appear unchanged by contact with the pitch.

From the lake to the outer end of the jetty runs an overhead conveyor, consisting of two heavy wire cables, on which runs an endless chain of iron buckets which take the barrels of asphalt. Vessels come to the outer berth at the pier and the barrels are lowered into their holds.

**Brighton Pier.**—There is a pier 2,150 feet long at Brighton, with two berths on each side, with 23 feet (7.0 m.) at the inner and 30 feet (9.1 m.) at the outer berth. Warping buoys are placed on both sides.

Steamers usually use the eastern side and sailing vessels the west, or lee, side. It is advisable to use a stout line to the buoy on the eastern side especially, owing to the tide and wind. Vessels usually use their anchor in addition to the mooring buoys.

The customhouse, the office of the company, and the residences of the manager and staff are on the jetty.

**Berthing signals** are made from a yard on the light tower at the end of the pier. A red ensign is hoisted at the yardarm on the side on which the vessel is to berth; if hoisted alone, the outer berth is to be taken, but if a pennant is shown beneath the ensign the inner berth is indicated. If only the International Code flag D is hoisted vessels are to anchor and await instructions. Vessels are requested to make their international number upon approaching.

There is a short pier on the southwestern side of Brighton Pier.

**Brighton Pier Light**, a fixed red light, 57 feet (17.4 m.) above high water, visible 10 miles is shown from a gray steel tower 47 feet (14.3 m.) high erected on the outer end of Brighton Pier.

**Anchorage** may be taken on any part of this coast, but for a visit to the lake a good position is in about 8 or 9 fathoms (14.6 to 16.5

m.) at  $\frac{1}{2}$  mile eastward of the Brighton Pier; the holding ground is good, the bottom being stiff mud. The harbor master will board vessels on arrival.

**The tidal currents** off Brighton Pier are strong; the flood current sets southwestward with a rate of  $1\frac{1}{2}$  to  $2\frac{1}{2}$  knots, and the ebb current northeastward, 1 to  $1\frac{1}{2}$  knots.

**Pitch Point.**—A small reef of pitch, dry at low water, extends from the northern part of La Brea Point.

In the village of La Brea are numerous deposits of land asphalt in pockets, which is dug out and shipped from the point in lighters; the holes from which the asphalt is obtained cause subsidence of roads and houses in all directions and become filled with dirty water and drainage.

**Pitch Point Pier.**—A pier 2,000 feet long extends in a northerly direction from the northeastern extremity of Pitch Point.

**Light.**—A flashing white light, elevated 36 feet (11.0 m.) and visible 6 miles, is shown from a mast at the outer end.

**Tides.**—The tides from the Dragons and Serpents Mouths meet just east of Brighton, and the currents are very irregular.

**Pilots.**—Pilotage is not compulsory, but because of the irregular currents and varying local conditions it is considered desirable for those vessels going alongside the piers. Pilot boat flies same signal as at Port of Spain.

Pilots can be obtained by arrangement at Port of Spain or off Brighton Pier.

**Directions.**—Vessels going direct to Brighton from the sea during the trade-wind season should steer for the Brighton Pier, but when the trade winds are not blowing should be careful to keep as far to the eastward as possible until they make the land and then run down the shore to Brighton.

The prevailing winds being from the eastward, vessels making the land to the westward of Brighton have great difficulty in working up to windward.

The trade wind, when in season, can be relied on; during the season when they are not blowing the prevailing winds are from the east, but are apt to be light and shifting.

Brighton and La Brea have communication by steamer with San Fernando, thence by rail to Port of Spain. There is also telephone communication with the capital.

The United States is represented by a consular agent whose offices are at Brighton.

**Supplies.**—Water of poor quality can be obtained. Other supplies can be obtained at Port of Spain.

**Fuel.**—Coal is not obtainable. There is an unlimited supply of fuel oil available which can be obtained from a pipe line on Brighton Pier.

**West coast.**—**Guapo Bay** ( $10^{\circ} 12' N.$ ,  $61^{\circ} 40' W.$ ; *H. O. Chart 1005*), southwestward of La Brea Point, is shallow, and the eastern

part dries off for the distance of  $\frac{1}{2}$  mile at low water. Some small streams discharge into this bay, affording excellent drinking water.

**Pelican Rocks**, situated at the eastern part of this bay, are 5 feet (1.5 m.) in height and 300 yards from the shore.

**Fortin Point**.—There is a 230-foot pier close eastward of Fortin Point owned by the United British West Indies Petroleum Syndicate, Ltd., having a depth of 7 feet (2.1 m.) alongside, and there is a railroad  $2\frac{1}{2}$  miles long from their property to the pier. This pier is used by the company's oil barges, which have a total capacity of 240 tons each and pumping capacity of 250 tons per hour. There is also a dolphin 20 feet square with a depth of 36 feet (11.0 m.) alongside, which is connected to the shore by a submerged pipe line capable of supplying gasoline at the rate of 100 tons per hour.

**Light**.—At about 1.3 miles  $333^\circ$  from the northwestern extremity of Fortin Point a dolphin has been erected. A flashing red light, 10 feet (3.0 m.) above high water, visible 5 miles, is shown from this dolphin.

**Irois Bay**, westward of Guapo Bay, is shallow, and the depth decreases gradually to the shore.

**Shoals** ( $10^\circ 10' N.$ ,  $61^\circ 48' W.$ ; *H. O. Chart 1963*).—A coral patch about 400 yards in circumference, with a least depth of 5 feet (1.5 m.), is situated about  $\frac{1}{2}$  mile off Rouge Point, western extremity of Irois Bay. A detached patch of 3 fathoms (5.5 m.) exists at  $\frac{1}{2}$  mile northeastward of this coral patch.

**Granville Bay**, between Rouge and Cedros Points, has a depth of 3 fathoms (5.5 m.) only at about 1 mile offshore.

**Cedros Bay**, lying between Cedros and Gallos Points, nearly 6 miles apart, is shallow, there being a depth of only 2 fathoms (3.7 m.) at  $1\frac{1}{2}$  miles offshore; it breaks in places during strong northerly winds. Its eastern part is known as Esperanza Bay.

Off Cedros Point the water is reported to be shoaling.

**Barrel of Beef**.—A reef extends 800 yards westward of Cedros Point, and at 1,600 yards westward of the point is Barrel of Beef Reef, awash at low water.

**Loo Reef**, with a depth of 1 fathom (1.8 m.), lies 600 yards  $291^\circ$  from Barrel of Beef Reef.

**Buoy**.—A bell buoy painted red is placed on the northern side of Barrel of Beef Reef. Too much dependence must not be placed on this buoy.

**EAST COAST—Outlying dangers—Delaware Bank** (*H. O. Chart 2319*).—In latitude  $10^\circ 50' N.$ , longitude  $60^\circ 21' W.$ , is a bank composed of sand and coral, about  $1\frac{1}{2}$  miles in extent, on which the least depth found is 13 fathoms (23.8 m.), with 17 to 40 fathoms



(31.1 to 73.2 m.) around, and 40 to 50 fathoms (73.2 to 91.4 m.) in a southerly direction at the distance of about 10 miles.

**Emerald Shoal** (*H. O. Chart 1005*), composed of live coral, sand, and shells, extends within the depths of 10 fathoms (18.3 m.), about 2 miles in a northeasterly and southwesterly direction, with a breadth of about  $1\frac{1}{4}$  miles; the depths around generally increase to 12 and 20 fathoms (21.9 and 36.6 m.), but there are two patches of 7 and 10 fathoms (12.8 and 18.3 m.), respectively, lying about 1 mile southward of its southern extremity, the shoalest spot found has a depth of 6 fathoms (11.0 m.), and lies on its northeastern edge.

The position of the shoalest spot, 6 fathoms (11.0 m.), is in latitude  $10^{\circ} 45' N.$ , longitude  $60^{\circ} 37' W.$ , or with Galera Point, computed from that position, bearing  $286^{\circ}$ , distance  $17\frac{1}{2}$  miles.

**Darien Rock**, situated with Manzanilla Point bearing  $269^{\circ}$ , distant  $23\frac{3}{4}$  miles, and Galera Point Light  $315^{\circ}$ , is about 40 yards in length, nearly flat and awash. It has been observed from aloft at a distance of 6 miles when the sea was breaking over it. There is a depth of 4 fathoms (7.3 m.) at about 20 yards around the rock, deepening to 10 fathoms (18.3 m.) at about 800 yards; and at the distance of  $\frac{1}{2}$  to 1 mile around depths of from 15 to 24 fathoms (27.4 to 43.9 m.) over sand and coral have been obtained.

There is ordinarily a confused sea for  $\frac{1}{4}$  mile around the rock, and a remarkable rip extends for about  $1\frac{1}{2}$  miles northeastward, giving the vicinity the appearance of shoal water. The current sets north-northwestward,  $1\frac{3}{4}$  miles per hour.

**Coast.**—From Galera Point to Galeota Point, the southeastern extremity of Trinidad, the coast trends nearly south for about 42 miles, and may, with the exception of a few isolated spots, almost be termed unapproachable; it is formed chiefly of one rocky and three long sandy beaches, each about 12 miles in length, on which the surf breaks heavily at all times, rendering landing nearly impracticable. These beaches are separated from each other by irregular points of moderately elevated land.

**Forest Point.**—Off this point, lying 1 mile southward from Galera Point, the rocks extend  $\frac{1}{4}$  mile and the sea breaks heavily.

**Cumana Bay** lies between Forest Point and Guayama Point,  $3\frac{1}{2}$  miles to the southward; it is the only place about here where landing could be effected, the shore being broken with sandy beaches. The neighborhood is under cultivation.

From Guayama Point the shore trends southwestward  $3\frac{1}{2}$  miles to Balandra Point and is composed of cliffs until within 1,500 yards of the latter point, when it becomes sandy and terminates close to the point in a steep rock.

**Balandra Bay**, lying immediately southwestward of Balandra Point (Islet-a-Bateau), is 1 mile wide and affords shelter under the northern shore for small coasters in  $2\frac{1}{2}$  fathoms (4.6 m.). This part of the coast is a sandy beach, and near the western end of it is a small stream. The coastal steamers depot, which is a black building with a red roof, is situated on the northern side of the bay.

From Balandra Bay to Fronton de Saline (Salibia Point), about 1,500 yards to the southward, the shore is rocky.

**Saline Bay** lies between Fronton de Saline and Matura Point; the eastern part is rocky, the western sandy, and at the head are two streams. Near Fronton de Saline there is a rocky islet; landing may be effected westward of the streams.

**Anchorage.**—Northwestward of the islet off Fronton de Saline there is shelter for small craft under 8 feet (2.4 m.) draft.

**Matura Point.**—The rocky shore and the base of the northern range of mountains terminate at Matura Point. From thence to the southward the shore is sandy; the interior is level, of moderate height, and densely wooded, with a few distant isolated hills rising out of the plain.

**Matura Bay.**—From Matura Point this sandy shore, nearly straight, trends southward for 10 miles to Manzanilla Point, upon which the surf breaks with such violence as to render landing on any part of it impracticable. The Oropuche River enters the sea through the surf over a bad bar about midway between the two points. Some seams of coal have been found in this bay; its shores are planted with coconut trees.

**McMillan Rock**, with a depth of 14 feet (4.3 m.) and 7 to 8 fathoms (12.8 to 14.6 m.) around, lies with the mouth of Oropuche River bearing  $288^\circ$ , distant  $2\frac{1}{2}$  miles.

**Cocoa (Cocos) Bay**, situated between Manzanilla and Mayaro Points, has a low sandy shore 11 miles in length planted with coconut trees. The streams L'Ebranche, Doubloon, Nariva, and Ortoire or Guatuaro discharge into this bay; the latter at its southern part is the largest in the island. There are heavy rollers all along this beach for more than  $\frac{1}{2}$  mile offshore, and landing is almost impossible.

**Manzanilla Bay.**—From Manzanilla Point the shore trends westward for 2 miles, and is for the most part rocky; but there is a little sandy bay to the westward of the point, known as Manzanilla Bay, in which there is shelter for small craft under 9 feet (2.7 m.) draft; and, being protected by some rocky islets near its eastern entrance point, is about the best anchorage on this side of the island. A reef of rocks, dry at low water, extends  $\frac{1}{2}$  mile eastward of Manzanilla Point and breaks heavily.

L'Ebranche River lies close westward of the cliffs on the western side of Manzanilla Bay. It is of no importance to navigation.

**L'Ebranche Rocks** ( $10^{\circ} 30' N.$ ,  $60^{\circ} 59' W.$ , *H. O. Chart 1005*).—At 2 miles southeastward of Manzanilla Point is a cluster of three small rocks, which dry 4 feet (1.2 m.) at low water, over which the sea always breaks, and  $\frac{1}{2}$  mile  $258^{\circ}$  from them there is a rock awash, but so small that it scarcely makes a breaker and is not seen until close to. Foul ground extends east-northeastward from the three rocks nearly  $\frac{1}{2}$  mile; the sea breaks over and about it in very bad weather, and near it the soundings shoal suddenly from 10 to 5 fathoms (18.3 to 9.1 m.).

**Anchorage.**—With the entrance of L'Ebranche River bearing  $314^{\circ}$  and Manzanilla Point  $22^{\circ}$ , there is fair anchorage in 5 fathoms (9.1 m.) and this is the best temporary anchorage on the coast, for a sailing vessel will have sufficient room to get underway in case of necessity. Vessels coming from the northward may run with safety between Manzanilla Point Reef and L'Ebranche Rocks, but the prevailing wind will scarcely permit a square-rigged vessel to work through this channel from the southward.

Anchorage may also be taken up at 1 mile southwestward of L'Ebranche Rocks in 7 fathoms (12.8 m.) sand and mud.

**Montserrat Range—Landmarks.**—From Manzanilla Point a ridge of hills, formerly known as the Cerros de Manzanilla, crosses the island in a west-southwestward direction to Point-a-Pierre, on the western side; on the eastern part of this ridge L'Ebranche (Brigand) Hill, 760 feet (231.6 m.) high; Mount Harris, 960 feet (292.6 m.) high; and Mount Tamana, 1,120 feet (341.4 m.) high, are prominent objects.

**Mayaro (Radix) Point**, a prominent headland separating Cocoa and Mayaro Bays, rises to a height of 346 feet (105.5 m.) and in clear weather may be seen from a distance of 18 miles. It is a bold, flat-topped promontory about 1 mile across, its eastern side presenting a face of high cliffs.

The northern extreme is known as Guatuaro Point and the south extreme as Mayaro Point.

**Reef.**—From its northeastern extremity a reef, dry at low water, extends 1,300 yards, and possible foul ground beyond. Shallow water with depths of less than 3 fathoms (5.5 m.) extends 1 mile southward of the southern extremity of the point.

**Shoal.**—Shallow water is reported to extend a distance of  $1\frac{3}{4}$  miles off Mayaro Point; until it can be thoroughly examined it is advisable to give the point a berth of about 3 miles, as a heavy swell sets in upon it.

**Anchorage.**—Northward of Mayaro Promontory, with Guatuario Point bearing  $157^{\circ}$ , and the westernmost rocky bluffs, near the mouth of Ortoire, or Guatuario River,  $224^{\circ}$ , there is good holding ground for small vessels about 1 mile from the shore, in 5 fathoms (9.1 m.), but the remarks on Mayaro Bay below also apply to this.

At about  $\frac{1}{2}$  mile to the eastward of the river, behind a projecting rocky point, landing may be effected.

**Manzanilla Bank.**—From Mayaro Point a bank with from 5 to 10 fathoms (9.1 to 18.3 m.) extends 13 miles in a northeasterly direction; depths of 11 and 12 fathoms (20.1 and 21.4 m.), coral bottom, are found in places for a distance of 8 miles beyond this in an easterly direction, this eastern position being known as **Manzanilla Bank**. The current causes a confused sea, and tide rips over portions of these banks.

**Mayaro Bay.**—From Mayaro Point the land again becomes low and sandy, and trends, with a slight curve, to Galeota Point, distant 12 miles, forming Mayaro Bay; it is thickly covered with coconut trees to within 5 miles to Galeota Point, or about 1 mile southward to Doyle's Store; steamers call here and ship produce from the plantations situated between the store and Mayaro Point. The magistrate's house is situated about  $11\frac{1}{2}$  miles southward of the point, and there is an Episcopalian Church, white, and a Roman Catholic Chapel about  $2\frac{1}{2}$  miles to the southward, but nearly hidden by the trees.

**Tourmaline Shoals.**—A bank of foul ground about 4 miles in length, with depths of  $3\frac{1}{4}$  to 4 fathoms (5.9 to 7.3 m.) and possibly less in places, has been found in Mayaro Bay lying parallel to the shore; between it and the bank fringing the shore there is a channel carrying a least depth of  $4\frac{1}{2}$  fathoms (8.2 m.) and which is used by those locally acquainted.

A patch of  $3\frac{1}{2}$  fathoms (4.6 m.) lies northward of the Tourmaline Shoals, 1 mile,  $144^{\circ}$  from the magistrate's house.

**Anchorage.**—In the northern part of Mayaro Bay and also within Tourmaline Shoals there is exposed anchorage in 4 to 5 fathoms (7.3 to 9.1 m.) and the sea is sometimes smooth enough to permit of landing on an extent of 2 or 3 miles of the coast; here the produce is shipped, but to the southward of this there is a heavy surf. The sea soon rises with the wind and renders communication with the shore dangerous and the anchorage unsafe.

The channel in northward of Tourmaline Shoals is to be preferred to the inshore channel southward, which is not recommended without local knowledge.

A flag-staff 110 feet (33.5 m.) in height has been erected near the boathouse.

**Buoy.**—A small beacon buoy is moored to the southward of Mayaro Point in 4 fathoms (7.3 m.), marking the edge of the reef north of the anchorage, used by the contract coastal steamers.

**Galeota Point** ( $10^{\circ} 08' N.$ ,  $60^{\circ} 59' W.$ ) is a narrow promontory 250 feet (76.2 m.) high, connected to the main island by lower land. It has on its sea face white cone-shaped cliffs, which when first seen open of the land from a distance appear as islands.

Several rocks above water lie off Galeota Point, and shallow water extends nearly 1 mile in all directions. The current sets toward it; therefore sailing vessels should give it a wide berth.

**Current.**—On the whole of the eastern coast of Trinidad the current sets in a northwesterly direction obliquely on the shore, assuming the trend of the land when near; its velocity is from 1 to 2 knots, and in passing over the coral banks and foul ground off Mayaro Point it causes a confused sea. Vessels anchored off the eastern coast ride very uneasily in consequence.

**SOUTH COAST—Guayaguayare Bay.**—Between Galeota Point and Grandecalle (Grand Cayo) Point, 4 miles apart, is a sandy but shallow bight known as Guayaguayare Bay. It affords shelter in its eastern part for small vessels, but the western half is incumbered by shoals; the depths are only 3 fathoms (5.5 m.) at 1 mile from the land.

**Anchorage** may be obtained with good holding ground in  $4\frac{1}{2}$  fathoms (8.2 m.) 1,300 yards  $247^{\circ}$  from the White Islets lying southward of Galeota Point.

The ridge of hills which borders the southern coast of the island commences to rise from Grandecalle Point, and northward,  $11\frac{1}{2}$  miles from it Guapare Hill rises to the height of 790 feet (240.8 m.).

**Tides.**—It is high water full and change at Guayaguayare Bay at 4 hrs. 25 min.; mean high water springs rising 7.0 feet (2.1 m.); mean high water neaps 4.0 feet (1.2 m.).

**The coast** from Grandecalle Point trends westward for 6 miles to Casa Cruz Point, and is everywhere steep, rocky, and unapproachable, with depths of 3 fathoms (5.5 m.) at from  $\frac{1}{2}$  to 1 mile from it. The Trinity Hills, so named by Columbus on his discovery of the island, lie immediately at the back of this coast and are 1,070 feet (326.1 m.) in elevation.

The depths off this part of the coast in 1927 were reported to have increased in positions 15 miles southward and  $16\frac{1}{2}$  miles southwestward of Galeota Point.

From Casa Cruz Point to Taparo Point the coast trends westward, with several slight indentations, for a distance of  $28\frac{1}{2}$  miles. It is generally steep, with two or three sandy beaches and rocks off the

projecting points which separate them; the hills decline in height to the westward.

The land about Casa Cruz Point is cultivated, and at about 1,500 yards westward of it water may be obtained with a little trouble from a mountain stream which runs into a well on the beach.

Moruga River, 6 miles west of Casa Cruz Point, has many rocks at its entrance, which extend 1,300 yards offshore. Boats find their way through them to a smooth landing.

The coast between Moruga River and Taparo Point, about 20 miles to the westward, is from 100 to 150 feet (30.5 to 45.7 m.) in elevation, and thickly wooded; several small bold points lie between, with a few rocks off them quite close to the shore. The depths off this part of the coast decrease regularly, and a vessel may anchor anywhere off it in 6 to 8 fathoms (11.0 to 14.6 m.), sand and mud.

**Serpents Mouth approach—Northern shore.**—Between Erin Point and the mouth of the Macareo River on the mainland the approach to Serpents Mouth, the southern entrance to the Gulf of Paria, is nearly 13 miles wide, with general depths of 8 fathoms (21.9 m.). The mainland forming the southern shore and the dangers which extend some 4 miles off it are described in the next chapter.

**Erin Point and Bay.**—Erin Point may be considered the northern point of the approach; between it and Islot Point, 8½ miles beyond, lies Erin (Herine) Bay, which may be known by three remarkable cliffs in it, the western of which is white, the middle red, 250 feet (76.2 m.) in height, and the eastern red and quoin shaped. This bay is shallow throughout, and on the edge of the 3-fathom (5.5 m.) curve are two shoals.

**Dispatch Reef,** at 5 miles 275° from Erin Point and 1½ miles offshore, has a depth of 6 feet (1.8 m.). Midway between it and Erin Point there is a patch of 12 feet (3.6 m.). The Quoin Cliff in range with Erin Hill (La Fabiana), 360 feet (109.7 m.) high, leads over Dispatch Reef.

To avoid these shoals keep in a greater depth than 6 fathoms (11.0 m.) and do not bring Erin Point to bear eastward of 78° when abreast them.

**Volcanic Islet.**—In December, 1928, this islet again rose above the surface and is now 6 feet (1.8 m.) high. It is located just south-eastward of Dispatch Reef.

Caution should be observed when navigating in the vicinity.

**Anchorage** will be found in Erin Bay, at from 1½ to 2 miles 270° from Erin Point, in 4½ to 5 fathoms (8.2 to 9.1 m.), mud.

Westward of Erin Bay the coast is low and sandy to Iacos Point (Punta del Arenal.) About midway is Islot Point and Bay.

**THE SERPENTS MOUTH (Boca de la Sierpe)** ( $10^{\circ} 02' N.$ ,  $61^{\circ} 58' W.$ , *H. O. Chart 1963*), between Icacos Point, the southwestern extremity of Trinidad Island, and the mainland in the vicinity of the River Cuscuina, on the opposite shore, is about 8 miles in breadth; it is difficult for sailing craft to navigate it, except from the eastward, on account of the prevailing easterly wind from the numerous shoals lying in the passage and from the strength of the prevailing westerly current, especially in the rainy season.

It is available, however, for steamers of moderate draft by day, and will materially shorten the passage in time, though the distance is about the same for vessels trading from Port of Spain eastward to Demerara, etc., by avoiding much of the current met with when taking the usual route around the northern end of the island.

See view C, *H. O. Chart 1963*, showing the Serpents Mouth from the southeastward.

**Caution.**—Too much dependence must not be placed on the buoys remaining in their assigned positions.

**Channels into Gulf of Paria—Eastern Channel.**—The Eastern or First Channel, between Wolf Rock and Icacos Point, thence between Demerara Shoal and the shoal water in Columbus Bay, has not less than 4 fathoms (7.3 m.).

**Second Channel** is westward of Wolf Rock and eastward of Three Fathom Bank between the red and black buoys, with a least-known depth of  $4\frac{1}{2}$  fathoms (8.2 m.).

**Middle or Third Channel**, between Three Fathom Bank and Soldado Rock, has a depth of not less than 4 fathoms (7.3 m.), over a breadth of about  $1\frac{1}{2}$  miles. It is generally recommended.

**Western or Fourth Channel**, between the patches westward of Soldado Rock and the flats fronting the main, has apparently depths in the fairway of 8 to 15 fathoms (14.6 to 27.4 m.), but as it has not been surveyed very closely it is better avoided.

**Icacos Point** (*H. O. Chart 1964*) is the northern point of the western entrance to Serpents Mouth. The coast in this vicinity is low and flat, covered with coconut trees from 50 to 70 feet (15.2 to 21.3 m.) high, with a white sand beach. It has but few prominent features. Approaching it from the eastward, Green Hill, 213 feet (64.9 m.) high, with a clump of coconut trees on it, about 4 miles to the eastward, is conspicuous. The most conspicuous object is the post office, while a short distance to the southward is a conspicuous cedar tree, which shows above the coconut trees.

**Icacos Point Light**, fixed white, 108 feet (32.9 m.) above high water, visible 10 miles, is exhibited from a white mast on Icacos Point. The light has been moved seaward at least once on account of the growing out of the point. (See Light List.)

**Columbus Bay.**—From Icacos Point the coast trends northward for about 1 mile to Corral Point, and thence northeastward  $1\frac{1}{2}$  miles to Gallos Point. Columbus Bay, lying between Corral and Gallos Points, is shallow for 1,500 yards offshore, and in northerly winds the sea breaks for a considerable distance out. The sandy shore of this bay is being constantly washed away and deposited on Icacos Point, which is extending.

The houses of the manager and staff of the Constance Estate are situated on Corral Point; sailing vessels anchor off the point to load with coconuts, several millions being exported here every year. Columbus anchored here in 1498.

**Gallos Point** is a yellow point about 90 feet (27.4 m.) high, off which Gallos Rocks, 7 to 50 feet (2.1 to 15.2 m.) high and eight in number, extend in a westerly direction for about 500 yards; some have bushes on them.

**The principal dangers** in the Serpents Mouth are the Wolf Rock, the rocks and reefs which lie around Soldado Rock, and the irregular banks and shallows extending off the mainland, which have not yet been examined.

**Wolf Rock** is a rocky patch 350 yards in diameter, lying on the western side of eastern channel, 700 yards westward of Icacos Point Light; it has several heads with 5 to 7 feet (1.5 to 2.1 m.) of water over them. Occasionally when a swell comes in from the northward it breaks heavily; it is nearly always plainly visible by a considerable rip over it.

**Buoys.**—A red bell buoy is moored on the eastern side of Wolf Rock and a red conical buoy is moored on its western edge.

**Demerara Shoal**, situated 1 mile northwestward from Icacos Light, consists of two heads with depths of 17 and 14 feet (5.2 and 4.3 m.) about 30 yards apart; it also lies on the western side of eastern channel.

**Buoy.**—A red conical buoy is moored on the southeastern side of Demerara Shoal.

**Three Fathom Bank.**—From 1 to  $1\frac{3}{4}$  miles, in a west-north-westerly direction from Icacos Point Light, there is a bank of shallow water, with numerous patches of 3 fathoms (5.5 m.), known as "Three Fathom Bank," forming the western side of second channel. The least known depth is  $2\frac{3}{4}$  fathoms (5.0 m.).

**Buoy.**—A black can buoy is on the eastern 3-fathom (5.5 m.) patch of the Three Fathom Bank.

**Soldado Rock** ( $10^{\circ} 05' N.$ ,  $62^{\circ} 01' W.$ ; *H. O. Charts 1963 and 1964*), locally known as "The Soldier," is 117 feet (35.7 m.) high, and when seen from a distance appears like a sail; sea birds resort to it to nest, and turtles are said to be plentiful at times around it.



Landing can generally be effected in a small cove on the north-western side, but with difficulty. (See views on H. O. Chart 1963.)

**East Reef**,  $2\frac{1}{2}$  feet (0.8 m.) in height, is 1,300 yards south-eastward from Soldado Rock.

**Southeast Rock** is the highest of a chain of rocks 3 to  $6\frac{1}{2}$  feet (0.9 to 2.0 m.) high, extending from 1,200 yards to 1 mile  $165^\circ$  from Soldado Rock.

**Southeast Ledge**, 200 yards in length approximately north and south with a depth of  $1\frac{1}{2}$  fathoms (2.7 m.), lies over 2 miles  $154^\circ$  from Soldado Rock.

Situated about 800 yards northwestward from Southeast Ledge are two patches with a least depth of 2 fathoms (3.6 m.).

**Pelican Rock**, at 1 mile southward from Soldado Rock, is  $2\frac{1}{2}$  feet (0.8 m.) high; and **Black Rock**, 2,400 yards  $207^\circ$  from the same rock, dries 6 feet (1.8 m.), and is therefore usually above water. Numerous smaller rocks, sunken patches, and reefs extend around those mentioned above, over which the current forms heavy rips and breakers at times.

**Three Fathom Patches.**—There is an isolated patch of 3 fathoms (5.5 m.) lying 2,700 yards  $117^\circ$ , a patch of 3 fathoms (5.5 m.) lying 1,700 yards  $50^\circ$ , and one of  $3\frac{1}{2}$  fathoms (6.4 m.) lying  $1\frac{1}{2}$  miles  $36^\circ$  from Soldado Rock. These are all situated on shoals within the 5-fathom (9.1 m.) curve surrounding them.

Patches of from 2 to 3 fathoms (3.7 to 5.5 m.) extend  $1\frac{1}{4}$  miles to the southwestward of Soldado Rock, and there is a patch of  $2\frac{1}{2}$  fathoms (4.6 m.) lying 3,800 yards  $188^\circ$  from Soldado Rock on the northern side of the Western Channel.

On the western side of Western Channel, at about 4 miles  $238^\circ$  from Soldado Rock, is a charted depth of  $2\frac{3}{4}$  fathoms (5.0 m.), the outer known portion of the mud flats extending from the mainland. The chart notes dangerous patches extending 1 mile eastward of it. For other patches inshore and farther westward, see the chart. The extent of these is not known, as the locality has not been surveyed.

**Range for clearing.**—Cedros Point in range with the outer Gallos Rock, bearing  $61^\circ$ , leads southward of all the dangers in the vicinity of Soldado Rock, and northward of Three Fathom Bank and Demerara Shoal.

**Tides and currents.**—It is high water, full and change, at Icacos Point, at about 4h. 33m.; springs rise  $7\frac{1}{2}$  feet (2.3 m.) and neaps  $4\frac{1}{2}$  feet (1.4 m.). The tides are said to be higher during the latter months of the year.

From observations made during March and April there was a constant current running through the Serpents Mouth to the north-

west of from 2 to 3 knots. This current is affected by the tidal currents, in that the greatest velocity observed was usually at or about one or two hours after high water, least at or about one hour after low water, and was generally greatest while the tide was rising at Icacos Point, so that the flood current sets in through the Serpents Mouth from the eastward, and vice versa. During the rainy season the strength of the current is probably greater by reason of the increased outflow of water from the Orinoco.

Off Icacos Point the current ran constantly to the northwestward at a velocity of from 1 to 3 knots; when the northwesterly current slackened at about the time of low water a strong undercurrent to the southeastward could generally be felt 5 fathoms (9.1 m.) below the surface, but at no other time, at the same time a west-going current of yellowish muddy water, in contradistinction to the usual olive green northwesterly current, would make its appearance off Corral Point and pass round the point to the southward, sometimes reaching as far as Wolf Rock; only after a continuance of strong northerly winds did the south-going surface current ever reach beyond Wolf Rock. Vessels at anchor off Corral Point usually swing with their head to the northward until two or three hours after low water.

To the eastward, off Cedros Bay and La Brea, the currents were observed to be tidal with a velocity of from  $\frac{1}{2}$  to  $1\frac{1}{2}$  knots, the ebb setting to the northeast for nine hours, or from high water to three hours flood, and the flood to the southwest from three hours flood to high water.

Generally, if a line be drawn in a northwesterly direction from Icacos Point, to the westward of this line the current is permanent to the northwestward, unaffected in direction, and but slightly affected in strength by tidal influence, while to the eastward of the line currents are affected by tide, both in direction and strength, and are irregular until eastward of Gallos Point.

**Directions.**—There is no difficulty in a steamer entering the Gulf of Paria by Serpents Mouth. The Trinidad side should be kept to avoid the delta of the Orinoco, the approach to which has not been fully surveyed, and shoals may exist off it which do not appear on the charts.

In a sailing vessel the most favorable period for entering the Gulf of Paria by the Serpents Mouth is during the summer or rainy months, when the trade wind is to the southward of east; indeed, it is seldom attempted at any other time by sailing vessels. In this case vessels approaching it will, of course, keep very much farther to the southward, toward the main, than if pursuing the northern route through the Bocas, to avoid being carried past the entrance by the strong current running northwestward, which is at its maximum at this period.

The approach to the Serpents Mouth, between Galeota Point and Baja Point on the mainland southward of it, is about 36 miles wide. The current runs here to the westward at from  $1\frac{1}{2}$  to 2 knots, increasing in velocity as it approaches the narrows to 3 knots.

As soon as a vessel has passed Galeota Point she should keep along the Trinidad shore at the distance of about 3 miles, where the depth will be from 15 to 10 fathoms (27.4 to 18.3 m.); and although the water will change its color occasionally, particularly when approaching Erin Point, where the water is shallower, about 8 fathoms (14.6 m.) there is no danger until Dispatch Reef is approached. Here a vessel should not come within the depth of 6 fathoms (11.0 m.). Erin Point bearing northward of  $78^\circ$  leads southward of the reef.

When southward of Erin Point, course should be altered slightly to the northward to head for a position about 1 mile south of Icacos Point Light.

Light-draft vessels may use either Eastern (First) or Second Channels, but moderate-draft vessels, if they come this way, which is not recommended, should take Middle Channel.

Having entered the Gulf of Paria through either of the channels mentioned, should it be necessary to work up to Port of Spain, some assistance may be obtained from the inshore tides, but the coast of Trinidad should be approached with the lead, and bearing in mind that within the depth of 5 fathoms (9.1 m.) the water shoals rapidly in places.

The only channel that is navigable at night, and by light-draft vessels only, is the eastern, near Icacos Point, provided Wolf Rock can be avoided; but should the wind fall light before reaching this far in daylight it will be more prudent to anchor, for it would be impossible for a sailing vessel to keep her position to windward against the current.

The land of the delta of the Orinoco is of uniform height, and may usually be seen from a distance of 15 miles.

**Eastern or First Channel.**—From a position 1 mile southward of Icacos Point Light alter course to the right to make good course  $350^\circ$ . This will pass 400 yards abeam of the light and to the eastward of Wolf Rock Bell Buoy and Demerara Shoal Buoy in a least depth of 4 fathoms (7.3 m.). If desired to obtain a slightly increased depth, when abeam of Icacos Point Light course may be altered to the right not more than  $5^\circ$ , care being observed not to bring Icacos Point Light bearing to the southward of  $163^\circ$  until abeam of Corval Point and then not south of  $173^\circ$  until Gallos Rocks bear  $90^\circ$ .

**Second Channel.**—From the position 1 mile to the southward of Icacos Point Light, alter course to the right and make good course

327°, which will pass 400 yards southwestward of Wolf Rock. When Icacos Point Light bears 90° distant 1,800 yards, alter course to the right to make good course 355°, which will leave the red buoys at Wolf Rock and Demerara Shoal on the starboard hand and the black buoy off Three Fathom Bank on the port hand, in a least depth of  $4\frac{1}{4}$  fathoms (7.8 m.). Because of the current, which sets in a northwesterly direction, care must be taken to see that the ship is not set off the course line. This channel will be found convenient in daytime, and is preferable to eastern channel, which is narrow and liable to be more or less obstructed by vessels at anchor off Icacos Point.

**Middle or Third Channel**, between Three Fathom Bank and Soldado Reefs, has depths of not less than 4 fathoms (7.3 m.) and is about  $1\frac{1}{2}$  miles wide, but is not buoyed. After passing Quemada and Icacos Points at the distance of 1 mile, bring Soldado Rock to bear 295° and steer for it on that bearing until Cedros Point is in range with the outer Gallos Rock, bearing 61°, then make good course 355°, allowing for the set of the current in the fairway, until Soldado Rock bears southward of 258°, when a vessel will be northward of all dangers. This channel is generally recommended; apparently there is not less than  $4\frac{1}{2}$  fathoms (8.2 m.) on this track.

**Western or Fourth Channel**, between Soldado Reefs and the mainland, is nearly 2 miles wide and is deep. The southern side of the channel has not been completely surveyed, but the examination made shows several dangerous shoal patches lying about 4 miles to the southwest of Soldado Rock, over which the current runs from 3 to 4 knots at times; for this reason and the absence of good marks for checking a vessel's position whilst passing through, this channel is not recommended.

**Anchorage.**—There is good anchorage between Icacos Point and Soldado Rock and vessels should be prepared to anchor when passing through these channels, but the only place where smooth water may be depended on if there is any wind is under the lee of Trinidad between Corral and Icacos Points.

**Landing** is always bad from Cedros Point round to Galpha Point; the best place is a little to the southward of the post office at Icacos Point, but it is seldom, if ever, possible to get ashore dry.

## CHAPTER VII

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### VENEZUELA—ORINOCO RIVER

**VENEZUELA** (*H. O. Chart 2319*).—The Government of the Republic of Venezuela is modeled after that of the United States, its chief provision being the autonomy of the States, excepting in respect to the power granted to the Federal Government.

The language of the country is Spanish, and, if possible, all correspondence should be carried on in that language; otherwise French may be used.

The capital of the country is Caracas, a city of 135,250 inhabitants in 1926, situated 7 miles from the coast and 3,000 feet (914.4 m.) above the sea.

The principal port is La Guaira, being made convenient to Caracas by an English railroad. It has good anchorage and wharf accommodations. Puerto Cabello, and Maracaibo have been developed into ports of importance and their equipment is modern. A railroad, also English, connects these ports with Valencia, which in turn is connected with Caracas by another railroad. Ciudad Bolivar is a port of some importance, situated 234 miles from the mouth of the Orinoco.

The United States is represented by a minister plenipotentiary at Caracas; by a consul and a vice consul at Caracas, Maracaibo, Puerto Cabello, La Guaira, and Ciudad Bolivar.

**Communication.**—Steamer communication with foreign countries is maintained by various foreign steamship lines, of which the American and Dutch are the most important.

Venezuela is connected with all parts of the world by submarine cable.

There are radio stations at La Guaira, Puerto Caballa, Maracay, Maracaibo and San Cristobal. (See International List of Radio Stations.)

**Interior communication.**—Venezuela has 12 railroad systems, with a total mileage of 661. Along the coast there are several short lines, connecting the interior and the sea. The most important lines are from La Guaira to Caracas, Caracas to Valencia, and Valencia to Puerto Cabello. In the west three lines approach Lake

Maracaibo, but they are independent of each other and serve different regions.

In addition Venezuela has several good carriage roads, which connect the railroads with the interior. In the mountainous and more remote regions pack animals are used for traffic.

**Interior waterways.**—Interior communication is facilitated by the numerous navigable rivers, of which the Orinoco, Meta, Apure, Portuguese, Yaracuy, and the Escalante are the most important. There is also an extensive coastwise traffic.

**The standard time** adopted is that of the meridian  $67^{\circ} 30' W.$ , 4 hours 30 minutes slow of Greenwich mean time.

**Ports of entry.**—There are 17 customhouses in Venezuela, located at the following places: La Guaira, Puerto Cabello, Maracaibo, Encontrada, La Ceiba, Carupano, Ciudad Bolivar, San Antonio del Tachira, La Vela de Coro, Tucacas, Guiria, Cristobal Colon, Puerto Sucre, Pampatar, Cano Colorada, Rio Caribes, and Rio Negro.

The port of entry for Barrancas is Ciudad Bolivar, and that for Guanta is Puerto Sucre. The ports of San Felix, Barrancas, Rio Caribes, Guanta, Higuerote, and Tucacas have been opened as ports of exportation only.

**THE ORINOCO RIVER**, which is by far the largest in the country, rises in the summit of the Parima Range, in the southern part of Venezuela and flows in a northwesterly, northerly, and northeasterly direction to its outlet in the Atlantic, a course of approximately 1,500 miles.

The first 650 miles of its course, or to the rapids of Apures, it is not navigable. But from this point to the sea, a distance of 850 miles, it can be navigated by small steamers.

In about latitude  $7^{\circ} 30' N.$ , longitude  $68^{\circ} 00' W.$  the Orinoco is joined by the Rio Apure, which is itself navigable by small steamers to San Fernando de Apure, a distance of about 120 miles up the Apure, and by ships of 3 to 4 feet (0.9 to 1.2 m.) draft throughout its entire length.

From the Apure to the town of Barrancas the Orinoco is joined on the south by the Caura, the Aro, and the Caroni. The last named is by far the largest. On the north, the Orinoco receives the waters of many small streams but none are of importance.

Just below the junction of the Apure is the town of Caicara. Ciudad Bolivar is situated about midway between Caicara and its mouth, and Barrancas midway between Ciudad Bolivar and Punta Barima at its mouth.

The banks of the river are fringed by dense forests, intersected by numerous creeks. The first clearing is at Curiapo, 37 miles above

Punta Barima, and consists only of a few stone buildings and Indian huts. The island south of Curiapo is known as Domingo Perez, the deep pass north of it having the same name, while the shallow pass south of it is known as Bolina de Curiapo.

The next settlement is at Manoa or Imataca, on the southwest side of Corosimo Island, 65 miles above Punta Barima, where there are iron mines, and which may be approached by vessels of 11 feet (3.4 m.) draft. At Manoa the spurs from the mountains of British Guiana first approach the south bank.

Above Manoa the forest is more open and the clearings numerous, being cultivated with sugar and bananas.

Barrancas, 128 miles above Punta Barima, is a village of about 1,300 inhabitants and consisting of a number of mud huts and grass streets.

Above Barrancas the hills approach the river on each bank.

Los Castillos, 146 miles above Punta Barima, is situated on a spur of the hills near the south bank. It was the original capital of the Spanish province of Guayana, but has been deserted on account of its unhealthiness. Two forts, situated near the town on hills about 160 and 390 feet (48.8 and 118.9 m.) high, respectively, command the river for a considerable distance.

The river here is about 1,400 yards wide.

Las Tablas (San Felix), 168 miles above Punta Barima, lies in a bight of the south shore, in which there is good anchorage. It consists of several large houses and a church; and a good road connects it with the gold mines in the interior.

The entrance to the Caroni River is about 3 miles above San Felix, and the falls about 4 miles up the river. The channel south of Fajardo Island is the one generally used, the northern one being used only at high river, when there is plenty of water everywhere, or at low river when the dangers can be seen.

**The delta of the Orinoco River** occupies the coast line of northern South American for a distance of about 160 miles and is cut by 6 streams of considerable size and 50 smaller ones. The easternmost and largest is called Boca Grande; westward, flowing into the Serpents Mouth and Gulf of Paria, respectively, are the Marcareo, Pedernales, and the Vagre, the most western rivers, next in importance to Boca Grande. These are navigable streams much used by shoal-draft vessels plying between Port of Spain and Bolivar. They shorten the distance very materially between these ports and avoid the dangers of the bar at Boca Grande. Between Boca Grande and the Marcareo River, a distance of 98 miles, are the Loran, Aragua, Araguapiche, Yaraguara, and the Mariusas, small streams about which very little is known. The Loran River is navigable for small vessels with local knowledge.

The depths in all the streams comprising the delta of the Orinoco naturally change with the seasons, and during the heavier rains, occurring from April to July, the northern part of the delta westward of Mangles Point is submerged. The inhabitants at this time live in the trees.

The principal streams of the delta unite with the main river at Barrancas, about 128 miles above Boca Grande.

**Boca Grande** ( $8^{\circ} 35' N.$ ,  $60^{\circ} 30' W.$ ; *H. O. Chart 1623*), the only navigable entrance to the Orinoco River used by seagoing vessels for ascending the river to the city of Bolivar, lies between Cangrejo Island and Barima Point and is about 10 miles wide. The approach to the entrance is obstructed by an extensive bar, which projects seaward for a distance of nearly 15 miles. In fact, it is only in clear weather that the trees, 60 to 75 feet (18.3 to 22.9 m.) high, on the eastern side of the entrance are visible from the outer edge of the bar. A survey in 1899–1900 shows a least depth of 13 to 14 feet (4.0 to 4.3 m.) above mean low-water level, with a maximum rise of 4 feet (1.2 m.). It is high water on the bar about one hour earlier than at Cangrejo Island. The depth on the bar is but little affected by the stage of the river. In bad weather there is a heavy and dangerous sea on the bar, and not over 11 feet (3.4 m.) should be carried at such times.

In April the water is sometimes fresh for 15 to 20 miles from the land, and occasionally remarkable lines of demarcation between the river and sea water are seen off the coast.

Vessels drawing 15 feet (4.8 m.) should have no difficulty in reaching Ciudad Bolivar, 225 miles up the river, from May to January, inclusive, but for the remainder of the year the draft is restricted to about 9 feet (2.7 m.). The tide does not affect the river above Barrancas, 128 miles from Boca Grande.

**Barima Point Light**, alternating fixed flashing light, fixed white with a red flash, 138 feet (42.1 m.) above high water, visible 18 miles, is exhibited from an iron lighthouse, 144 feet (43.9 m.) high, painted white, with a red lantern, on Barima Point. The official pilot service has been transferred to this lighthouse and the pilot boat puts off immediately when a ship is sighted.

A small pier runs southwest from the lighthouse.

**Pilots.**—The pilots are for river service pure and simple, and as such are experienced and trustworthy. They do not object to going outside to bring a vessel in, provided the vessel sends a boat for them. Under such circumstances, according to report, a pilot is only helpful in warning captains of vessels against going where hard bottom is found and in making a safe course as soon as the land can be clearly distinguished. They have only a small boat at their disposal, and it is seldom that they go outside to help vessels in over



the bar. No pilot boat cruises outside the Boca Grande, so that ordinarily vessels must cross the bar without a pilot.

The pilots all prefer the Sabaneta side of the channel across the bar owing to the soft mud bottom found on that side, while hard sandy spots will be found on the Cangrejo side.

In making the ascent of the Orinoco the service of a pilot is indispensable, and a vessel, it is understood, attempting to ascend the river without a pilot and coming to grief in consequence would forfeit her insurance. The same penalty attaches to a vessel which suffers damage while under way between sunset and sunrise, even though a pilot be in charge.

A pilot for the Boca Grande Bar should be obtained at Port of Spain or Demerara; otherwise it is advisable, if practicable, to anchor outside the bar in 4 fathoms (7.3 m.) and send in to the pilot station for a river pilot.

**Cangrejo, Watts, Tercera, and Ramon Isidro Islands.**—This group of islands, the most easterly of those that border the entrance to the Orinoco on the north, are covered with trees 60 to 75 feet (18.3 to 22.9 m.) in height. Cangrejo Island, the largest, is separated from Watts Island,  $1\frac{3}{4}$  miles long north and south,  $\frac{1}{4}$  mile wide, lying eastward of it, by a narrow passage. Tercera Island, 1 mile long east and west, and about 1,500 yards wide, lies eastward of the southern end of Watts Island, from which it is separated by a narrow but deep channel, through which runs a strong current. Ramon Isidro Island, the most easterly of the group, lies north-eastward of Tercera Island and close to. It is surrounded by banks, which dry at low water.

**Banks in entrance.**—The southern shore of the Boca Grande from Mocomoco Point takes a westerly direction for about 15 miles to Barima Point at the mouth of the Barima River, fronted by the Sabaneta Bank on the east and Cangrejo Island and Bank on the western side of the channel across the bar.

There is at present much less water on Cangrejo Bank and in the channel southward of it and the bank is reported to be growing to the southward and eastward. The bank has hard spots in places.

Between Barima Point and Cangrejo Island the river is about 10 miles wide, but southward of the latter it is reduced to about 4 miles. The southern extremity of Cangrejo Island appears as a bluff and is readily made out.

**Sabaneta Bank** lies eastward of the channel and in places appears to be drift mud. It is reported that the bank is washing away on its eastern side and making on its western side. Vessels drifting on it and drawing 12 to 15 feet (3.7 to 4.6 m.) have been able to force themselves over it.

**Barima River** communicates with the Waini or Guayma to the eastward by Morawhanna Creek, which is navigable for steamers drawing 7 feet (2.1 m.) of water by waiting for the tide at the Waini end. At about 5 miles southwestward of Barima Point is the entrance of the Amakuru River. There are boat-landing places just inside the mouth of the Barima and Amakuru Rivers on the eastern bank.

**Height of river.**—In the Orinoco River the periodical rise of the water commences immediately after the vernal equinox, but during the first month it does not exceed an inch in 24 hours, and sometimes it falls again in April. In July or August the river usually attains its greatest height and remains at the same level till about the last of August, when it gradually falls, and reaches its lowest state in February and remaining so until March. From August to the end of the year the stream is rapid, 5 knots in places, but there are strong eddies or countercurrents near the banks, of which the pilots take advantage in ascending the river. The ordinary rise in the lower Orinoco is estimated to be from 50 to 60 feet (15.2 to 18.3 m.); the height, however, naturally varies according to the breadth of the bed and the number of tributary streams received by the main trunk.

At Ciudad Bolivar, 225 miles from the sea, the range between high and low river is 40 feet (12.2 m.) and over 52 feet (15.8 m.) at extreme high river. Formerly, in the dry season, vessels were obliged to stop about 40 miles lower down, below Mamo Bar or Pass, which at this time had only 4 or 5 feet (1.2 or 1.5 m.) water on it, and transship their cargoes to the capital in canoes, but this pass has usually 12 feet (3.7 m.) of water when the river is at its lowest (1900).

At Barrancas, which is about halfway between the entrance and Ciudad Bolivar, the maximum rise and fall of the river is 30 feet (9.1 m.), and here the creeks unite into a single channel from 1 to 3 miles wide, with a general depth of 7 to 20 fathoms (12.8 to 36.6 m.), but many sand banks, most of which are above water in the dry season, and occasionally masses of granite, form little islands in the stream.

The depth in the passes varies from year to year and can never be absolutely depended on. The best months to navigate the river are from June to October, but the river is now used to Ciudad Bolivar at all seasons by steamers of 9 feet (2.7 m.) draft. At high river it is available for vessels of 15 feet (4.6 m.) draft.

**Tides.**—The corrected establishment at the tidal station on Can-grejo Island, deduced from observations covering a complete lunation, was found to be 4h. 54m. High water occurs one hour earlier

on the bar than at Cangrejo Island. The spring tides have a mean range of 5.5 feet (1.7 m.), neaps 4.6 feet (1.4 m.). On the bar it is said the spring rise is only about 4 feet (1.2 m.). At 30 miles above the mouth of the Orinoco the flood will make at 2h. 22m. It is high water, full and change, at Yaya Bar at 2h. 25m. Springs rise  $2\frac{1}{4}$  feet (0.7 m.). Below the bar the flood tide runs from  $\frac{1}{2}$  to 1 knot, ebb tide from  $1\frac{1}{2}$  to 2 knots. At the mouths on the edge of the delta, westward of Mangles Point, the rise is 7, 8, and even 10 feet (2.1, 2.4, and even 3.0 m.) within the Gulf of Paria.

The flood tide sets to the westward, the ebb to the eastward, and reaches a maximum velocity of 2 knots.

The tidal currents at a short distance from the land are of about six hours duration. Within the bar the flood current sets about southwest, velocity  $\frac{3}{4}$  knot, the ebb current northeast, 1 knot.

The current varies in strength at different seasons of the year and also in different parts of the river. The pilots state that the current runs from 6 knots in the very narrow parts of the river to  $1\frac{1}{2}$  knots where the river expands to 4 or 5 miles.

At Barrancas there is a very slight rise and fall of tide, but no flood current, nor does the downward current slacken appreciably during the flood.

**Directions for entering the Orinoco.**—The land about the entrance of the Boca Grande is low and very difficult to recognize, and unless the weather be very clear nothing can be seen. Barima Point is not easily distinguishable, as the trees are much the same height. On the western side of the entrance the trees are much lower, and their continuity is interrupted by the mouths of the smaller branches of the river. The lead must be kept in constant use, as it is stated that a vessel may get aground northward of the river out of sight of land.

In 1922 the British naval vessel *Wistaria* visited this river and remarked that the lighthouse is difficult to pick up unless good sights are obtained. From a point 30 miles  $7^{\circ}$  from the lighthouse she made good  $190^{\circ}$ , to an anchorage  $2\frac{1}{2}$  miles  $300^{\circ}$  from the lighthouse. The bar was crossed at low water (halfway between springs and neaps) and the least soundings obtained were  $2\frac{1}{2}$  fathoms (4.6 m.). Soundings were taken every two minutes throughout the entire passage up and down, and except where shown on the chart there was no bottom at 6 fathoms (11.0 m.).

**Caution.**—The chart of the Boca Grande is not to be depended upon.

**Anchorage.**—There is good anchorage anywhere inside the bar, in a depth of from 18 to 22 feet (5.5 to 6.7 m.), with soft, muddy bottom and good holding ground.

**Boca Grande to Ciudad Bolívar** (*H. O. Charts 1623, 1624, 1625, 1626, 1627, 1628, 1629, and 2109*).—The U. S. S. *Wilmington* ascending the river in 1899 followed the *Kearsarge* track. As the river was much lower than when the *Kearsarge* made her ascent, in 1892, many rocks and shoals were observed to be uncovered that did not appear on the *Kearsarge* charts; these were perhaps then covered.

Marks on banks and trees showed a vast range from the stage of water in January to that of high water in August, varying from 2 feet (0.6 m.) at Cangrejo Island to 35 feet (10.7 m.) and over at Ciudad Bolívar.

The *Kearsarge* and *Wilmington* found the channel to be approximately the same. In 1922 the British naval vessel *Wisthiora* ascended the river and, with the exception of the differences which will be noted, approximately followed the track laid down on Hydrographic Office charts.

Starting with  $4\frac{1}{2}$  fathoms (8.2 m.) at a position between Barima Point and Cangrejo Island January 22, 1899, the *Wilmington* found 6 to  $7\frac{1}{2}$  fathoms (11.0 to 13.7 m.) in the channel between the island and bank and the southern shore of the river. The depth of  $7\frac{1}{2}$  fathoms (13.7 m.) was entered when the bank was cleared, the eastern end of Cangrejo Island bearing  $76^\circ$ . From off this point the course is about west until reaching a group of islands, when it changes to the northwestward and then to the southwestward in rounding the islands, passing to the northward of them, then to the southward, passing Rio Curiapito and Curiapo Village on the starboard hand.

**Yatica Point**, on the southern shore, extends well out, and the channel runs close to it.

**Paso de Domingo Perez**.—Near Curiapo Village ascending vessels should stand over toward the southern shore and steer a southerly course until Paso de Domingo Perez commences to open, when course should be changed sharply to the right to stand through the pass, northward of Domingo Perez Island. Here, for about  $2\frac{1}{2}$  miles, the river narrows considerably.

**Imataca River, or Cano Imataca** ( $8^\circ 23' N.$ ,  $61^\circ 17' W.$ , *H. O. Chart 2109*) is a narrow bayou or creek branching off from the Orinoco, on its southern side, about 70 miles above Barima Point. It is only about 300 feet wide, having from 2 to 4 fathoms (3.7 to 7.3 m.) along the banks and 6 to 7 fathoms (11.0 to 12.8 m.) in midchannel. The *Wilmington* anchored opposite its western mouth in  $10\frac{1}{2}$  fathoms (19.2 m.) of water. There is a rocky ledge about 2 miles from its western mouth, which is shown by the rocks on the southern shore and ripple in the channel. It has  $3\frac{1}{2}$  fathoms (6.4 m.) of water over it in mid-channel. The eastern mouth of the Cano Imataca is at the western end of Lorgueta Island, where

it is joined by the Cano Lorgueta, the passage on the southern side of Lorgueta Island.

The Cano Imataca has a semicircular course, and the large island (Corosimo) formed between it and the Orinoco proper is low and thickly wooded.

**Port Manoa, or Imataca,** is on the southern shore of the Cano Imataca, about midway between its eastern and western mouths and northwestward of the Imataca iron mines. These mines are southeastward of Port Manoa, or Imataca, where the land rises sharply until at a distance of  $\frac{1}{4}$  mile, where the mines are located, it attains the height of about 300 feet (91.4 m.)

Vessels can lie close to the bank and load to any desired depth, and if too long to turn can either tow out stern first or enter by the eastern mouth at Lorgueta Island and go out by the western mouth into the main river, where the current on port bow would assist in heading downstream.

The manager of the mines stated that the water in the Cano Imataca was never affected by the ocean tides and always remained fresh. According to the reconnaissance by the *Wilmington*, and also the statement of the pilot, the water is deeper in the channel of the main river than in the Cano Imataca.

**Devils Hook Point (Diavalo).**—In the Orinoco, about 10 miles above the western mouth of the Cano Imataca, is Devils Hook Point, a narrow point projecting from the southern bank, and beyond which the river again widens.

**Punta Piedra.**—Farther on, about 10 miles, is Punta Piedra, on the southern shore, beyond which the banks on both sides begin to be from 4 to 8 feet (1.2 to 2.4 m.) high, the trees larger, and the foliage less dense and tropical in appearance, and the large ceiba (silk cottonwood) trees are seen. Opposite this point, there are two low sandy islands covered at high water.

**Santa Catalina River or Cano Santa Catalina.**—Beyond Punta Piedra about 12 miles and 26 miles below Barrancas is the Cano Santa Catalina, opening on the southern shore, and which the *Wilmington* ascended for about 5 miles, finding 5 to 7 fathoms (9.1 to 12.8 m.) of water, and stopped off the village of Santa Catalina, where are the local manager and office of the Orinoco Improvement Co. A hotel, capacity 100 people, has been built for the employees on a ridge about 40 feet (12.2 m.) above water, and near by is the village. About 15 miles to the southward are Imataca Mountains, wherein are mines and to which a trail leads.

**Tortola Island and Rio Tortola.**—Cano Santa Catalina and Rio Tortola, Piacoa Channel, forms, with the Orinoco, the large island of Tortola. Sand bars extend off the western entrance of the Rio Tortola.

**Macareo River—Yaya Bar.**—About 18 miles farther on and 6 miles below Barrancas is the mouth of Macareo River, and across which is Yaya Bar, the first shoal encountered after crossing the bar at Boca Grande. The least depth reported over this was about 21 feet (6.4 m.) in 1922. Opposite, on the southern shore, is the mouth of Rio Tortola.

**Barrancas**, 128 miles above Barima Point, is a village of 1,300 inhabitants and consisting of a number of mud huts and grass streets. It has a considerable trade in cattle.

### **Regulations for the inner port:**

**ARTICLE 1.** Limits of the port: The Port of Barrancas is comprised between the point where the range of hills begins, called "Oustilla," on the east, at the end of the town, to the place called "Los Corrales," on the west, and has an extent of about 880 yards.

**ART. 2.** Entry of ships: Steamships must enter the port at half speed, and observe the precautions and regulations made by the Sea Laws for avoiding collisions with other ships anchored in the port.

**ART. 3.** All steamships and sailing vessels of 10 tons and more should anchor inside the limits of the port at a distance of not less than 25 yards from the bank.

**ART. 5.** All ships arriving from seaward, as also those engaged in coasting, should be careful to abstain from any operation of disembarkation till they have been visited by the health officer and carried out the regulations made by the port authorities. In cases where passengers seriously ill, but not infectious, are on board the captain of the vessel should request permission from the administrator of customs and the captain of the port to disembark them; they will determine as convenient.

**ART. 6.** All vessels should anchor at a distance of not less than 25 yards from those already in the port, and in a parallel direction, so that in case of dragging or swinging they may avoid colliding with one another.

**ART. 8.** No ship having on board explosive substances, such as dynamite, powder, etc., can anchor, except in the middle of the river, and must keep at a distance from other ships of not less than 45 yards. It ought, moreover, as soon as it enters, to hoist a red flag and can not disembark such substances unless its captain has taken the necessary precautions.

**ART. 9.** Every ship, on entering the port, should hoist the flag of its respective country.

**Special paragraph:** When carrying a foul bill of health or having on board contagious or infectious cases requiring observation or quarantine, ships should hoist, in addition, a yellow flag.

**ART. 10.** Ships which anchor at a distance greater than 30 yards from the position they remain in should mark the anchor by a buoy.

**ART. 11.** Anchoring: No vessel at anchor can alter its position without permission of the captain of the port, except to avoid danger.

**ART. 13.** No ship shall remain at any hour of the day or night without the crew necessary to work it and carry out maneuvers requisite in case of urgency.

**ART. 15.** No ship shall moor to the buoys, cables, or stream cables or other lying in the water, and it is also prohibited to stretch ropes or cables from one ship to another. Steamships requiring to lie tied up to one another should keep sufficient watch to slacken the ropes when required by traffic.

**ART. 16.** Ships anchored in port should carry between 6 p. m. and dawn, at a height clearly seen, globular lights, visible all round; those with one mast only showing one light on one of the shrouds; steamers or ships with more than one mast showing, at least, lights colored green and red on port and starboard.

**ART. 20.** Sailors and other employees of the ships stationed in the port must not be transferred from one ship to another except in cases of mutual assistance in accordance with article 18 of these regulations, nor may they disembark after 7 p. m. without permission of the port authority.

**ART. 22.** Ships stationed in the port shall hoist their national flag on Sundays and national festivals from 6 a. m. to 6 p. m.

ART. 23. Loading and unloading of ships shall be carried out exactly in the space comprised between the river ends of the streets "Clavellina" and "Libertad."

ART. 25. Pending the unloading of a ship which will remain anchored in the port more than 24 hours without commencing operations, the captain will acquaint the captain of the port accordingly, in order that the latter may fix the place where it will proceed to. The same should be done by captains of ships arriving in ballast and purposing to remain anchored in the port for an indefinite time.

An executive decree ordered the closing of the customhouse at Barrancas on July 1, 1917. This will therefore no longer be a port of entry. The port of entry for Barrancas is Ciudad Bolivar. The same decree establishes Barrancas as a port of exportation only.

In the port of Barrancas, over a length of 660 yards and a width of 880 yards, there is a depth of 36 feet (11.0 m.). Entering by Boca Grande, the Pasa de Yaya is 6 feet (1.8 m.) and 16 feet (4.9 m.) deep at high water. Entering by the Baro of Macareo and Pedregales, the Pass of la Pastora has 7 feet (2.1 m.) at high water. Leaving the port for Ciudad Bolivar, the Pass de Guaraguapo and Varadero de Yaya have 11 and 12 feet (3.4 and 3.7 m.), respectively, at high water.

**Bolina Pass**, about 4 miles above Barrancas, is a narrow pass between sand banks, and in 1902 was reported to carry a least reported depth of 9 feet (2.7 m.). In 1927 it was reported that a vessel drawing 16 feet (4.9 m.) was able to go through this pass.

**Punta Tigre and Punta Gavilan**, about 200 and 300 feet (61.0 and 91.4 m.) high, respectively, are rocky points below Guayana Vieja and make well out.

**Los Castillos** is a detached steep hill on the southern shore and having a canita or creek in its rear. There is a garrison and an old fort about 400 feet (121.9 m.) in height, but no ordnance. It was originally the capital of the Province, but was abandoned owing to its unhealthfulness.

**Mucura Pass**, just above Los Castillos, is a narrow channel formed by an island and some sand banks, with a least depth of 18 feet (5.5 m.); the current runs through it very strongly with dangerous eddies.

After passing Angosturito Point the spire of the cathedral and white houses of the city of Bolivar are plainly seen.

**Las Tablas**.—The town of Las Tablas (San Felix) is about 3 miles inside the Caroni River and on the eastern bank. It is the second city on the river in size and importance, and is the distributing point for supplies of all kinds to the gold-mining regions to the southward.

Since 1902 apparently the shape of Isla Fajardo has changed, as the *Wistaria* in 1922 did not find the shore to southward of the

Isla Fajardo, projecting as far to the northwestward, or the three low sandy islands shown on H. O. Chart 1628.

The channel south of Fajardo Island is the one generally used, not the one shown on Hydrographic Office Chart 1628, the northern one being used only at high river when there is plenty of water everywhere, or at low river when the dangers can be seen.

**Palosolo Rocks** are northward of this island.

**Palital and Mamo Pass.**—The course leads close to the northern bank in rounding the point upon which is located Guarampa Hill, 200 feet (61.0 m.) high. About 4 miles beyond is Palital Pass, northward of Isabel Island with a low-river depth of 12 feet (3.7 m.). The channel is narrow, with rocks on one side and sand banks on the other. Northward of Isabel Island there is a low, sandy island covered with grass and submerged at high river, known as Taguache. Westward of it, there is a similar islet known as Cayman. These islets are not shown on Hydrographic Office Chart 1628. Mamo Pass has a least reported depth of 12 feet (3.7 m.). It is a narrow channel between sand banks which are constantly shifting. Care should be exercised at this place, as the navigation is difficult.

**Rosario Pass** is dangerous because of the numerous sunken rocks and the strong current which attains a velocity of 4 knots. About  $2\frac{1}{2}$  miles below Rosario Island there is a wreck-marking vessel painted green and carrying a large ball at the masthead, two small balls at the port yardarm, and a lantern at the starboard yardarm. She is moored close southward of the wreck. Rosario Pass appears to be exceedingly dangerous, as the strong current sets over the rocky shoal to the northward, and it is not possible to stem it until in the pass. It must, however, be about 400 yards wide, as *Wistaria* passed about 300 yards off Rosario Islet. There are numerous rocks to the southward of the islet, and this channel is only used at high river, when there is enough water over them, or at low river, when they can be seen.

**Panapana Pass**, 10 miles farther up the river, is similar to Rosario Pass and also has a current of about 4 knots.

The least depth reported in these passes is 9 feet (2.7 m.) low river, but in some years there is as much as 18 feet (5.5 m.). No attempt should be made to go through any of these passes at night.

**Ciudad Bolívar (Angostura)** ( $8^{\circ} 09' N.$ ,  $63^{\circ} 33' W.$ , *H. O. Chart 1629*) the capital of the State of Bolívar is the largest and most important city on the Orinoco River and the fourth in importance among Venezuelan ports. It is situated on the right bank of the river 228 miles from its mouth, at an elevation of 190 feet (57.9 m.)



Bolivar is at the head of navigation for seagoing vessels; river steamers and launches ascend to San Fernando de Apure at high river. Rafts and canoes bring hides and forest products from Colombia and the southern wilderness.

**Anchorage.**—Opposite Bolivar the river is contracted by the rocky gorge and the current is 4 knots and over; the water is deep in midstream, hence vessels should anchor near the city water front. The British naval vessel *Wistaria* anchored in 7 fathoms (12.8 m.) 400 yards eastward of the market place, and about 150 yards from the shore, and lay at single anchor. Abreast this position the current runs downward along the shore, but a little farther west there is a countercurrent. The above anchorage is out of the main current, but there was sufficient current to prevent the ship from swinging more than about four points during chubascos, which are short sharp squalls which blow up the river with considerable force with heavy rain, usually between 4 and 5 p. m.

The current in these narrows runs about 5 knots in December, when the river is at about half ebb. The width between Market Place Point and the rocks below Soledad, on the left bank of the river, is 776 yards at the mean level, but above as well as below these narrows it not infrequently expands to 3 miles.

Close above Market Place Point there is a steep-to rocky islet in midstream with a telegraph structure on it. This and a similar structure on each bank support two telegraph wires stretched across the river. The center structure is the lowest, its height being 102 feet (31.1 m.) above the mean level of high river, when the islet is just awash. Ships may pass close either side of the islet where the height of the wire is about 98 feet (29.9 m.). The lowest part of the sag is about 94 feet (28.6 m.)

**Winds.**—Strong winds from the westward are experienced at Bolivar from July to October, and during the rest of the year their direction is about northeastward or up the river; sometimes in December smart squalls from the northward come on.

**CIUDAD BOLIVAR** has many fine buildings, as well as a large cathedral, which stands on elevated ground, the spire of which can be plainly seen at a distance of 10 miles. The city is kept fairly clean and in good sanitary condition. It is lighted by electricity. The population is about 20,000.

The United States is represented by a consular agent.

**Wharves.**—There are no wharves; boats land on the banks as convenient, and vessels discharge into lighters.

**Repairs.**—There is a foundry and machine shop at Bolivar having facilities for repairing river steamers.

**Supplies.**—Water is plentiful, being taken from the river; the supply for the city is filtered. There is no coal; wood is abundant; beef is plentiful; provisions, except beef, are scarce and high. The facilities for supplying ships are poor.

**Water.**—The confluence of the Caroni River a little above the village of Las Tablas, 165 miles within Barima Point, is an excellent place for water-

ing, its water keeping clear and transparent amidst the turbid waters of the Orinoco for a considerable distance, though the latter is by no means unpalatable or unwholesome.

**Communication.**—There is regular communication between Bolivar and Trinidad by river steamers via the Macareo River, which ply between those ports about every 10 days and connect with New York and European steamers. The steamers touch at Barrancas and other river ports. There is communication with interior Venezuela by governmental system that prevails in other parts of the Republic. Telegraph lines run to Caracas and various other cities of the Republic. The city is also in telegraphic communication with Europe by way of La Guaira. There are no railroads.

**Radio.**—There is a Government radio station, call letters AIRE, which accepts commercial messages.

**Climate.**—The climate of the Orinoco is not unhealthful; at Bolivar intermittent fever is prevalent at times and occasionally beriberi; the worst period is after the greater rains. The mortality of the State of Bolivar is only 1.7 per cent. (See Meteorological Tables, Appendix IV.)

**Hospitals.**—There are two hospitals—one for women, the other for men—having a capacity of 60 each. These hospitals are free.

**Table of distances.**—The following table of distances on the Orinoco River is taken from the charts:

Positions	Nautical miles	Distance from Barima Point
Punta Barima to Cangrejo.....	12	12
Cangrejo to Curiapo.....	25	37
Curiapo to Imataca.....	28	65
Imataca to Yaya Bar.....	57	122
Yaya Bar to Barrancas.....	6	128
Barrancas to Los Castillos.....	18	146
Los Castillos to San Felix.....	20	166
San Felix to Mamo Pass.....	28	194
Mamo Pass to Rosario Pass.....	10	204
Rosario Pass to Panapana.....	6	210
Panapana to Ciudad Bolivar.....	15	225

**Coast** ( $9^{\circ} 32' N.$ ,  $60^{\circ} 59' W.$ , *H. O. Chart 2319*).—From Boca Grande the coast trends in a northwesterly direction to Baja Point. This part of the coast is unsurveyed and should not be approached within 10 miles or within the depth of 5 or 6 fathoms (9.1 or 11.0 m.). Mangles Point lies some miles westward of Baja Point but is not easily identified.

**Other channels—Macareo River.**—At the Yaya Bar, the apex of the delta of the Orinoco River, the river divides into two branches, the northern of which is called the Macareo and reaches the sea after a course of about 150 miles. The mouth of this stream is divided by Redonda Island, the channel on the eastern side being the navigable one. It is the broadest channel, and has from 12 to 15 feet (3.7 to 4.6 m.) at high tide. The current varies from about 2 knots at low river to 4 knots at high river. The tide rises 6 feet (1.8 m.).

Inside the entrance bar, the depth of river increases to 5 fathoms (9.1 m.) and its navigation is simple as far as Punto Zebingo; where, because of a sand spit, marking the junction with the Peder-

nales River, the width of the channel is considerably lessened. above this point the Macareo again deepens until near the junction with the Orinoco proper, in Mata Mata Pass, there is a depth of only 12 feet (3.7 m.).

Twenty-four miles from the bifurcation of the Orinoco the Macareo itself divides, leaving the Vagre on the left hand. This channel follows a more westerly course than the Macareo and is 144 miles long from the point where it leaves the latter to the sea. It is rather narrower than the Macareo and has less wind. It has 14 to 15 feet (4.3 to 4.6 m.) of water in the rainy season. There are five shoals, but none are dangerous. The current runs 3 knots and there is a tidal rise of 6 feet (1.8 m.).

The Vagre, various smaller channels, and the Pedernales, on reaching the sea, together form one large mouth, which is called the Boca de Pedernales.

The Pedernales Channel leaves the right bank of the Vagre about 25 miles from where the latter leaves the Macareo, and after a course of 104 miles empties itself into the Gulf of Paria, not far from the mouth of the Vagre. The total distance from Yaya Bar to the Boca de Pedernales, via the Pedernales Channel, is thus 153 miles. There is 8 to 10 feet (2.4 to 3.0 m.) of water, with eight shoals, none dangerous. The tide rises 6 feet (1.8 m.) with a current of 4 knots.

While the Macareo Channel is the one exclusively used by the *Compañía de Navegación Fluvial y Costañera de Venezuela*, this company has a contract with the Government by which it exercises the sole right of running steamers on these three channels above mentioned. The Macareo provides the shortest route from Port of Spain to Bolivar, and is the easiest navigated. The greater part of the whole trade of Bolivar is carried on through Port of Spain, and this route possesses the distinct advantage of distance over the Boca Grande route and avoids exposure to the open sea. The latter route would require vessels of a seagoing type, while the shelter of the Gulf of Paria is sufficient to allow the use of stern-wheel steamers on the Macareo route.

**Gannet Shoal**, with a depth of 1 fathom (1.8 m.), mud, and 5 to 6 fathoms (9.1 to 11.0 m.) close around, is charted about  $4\frac{1}{2}$  miles northward of the Macareo River on the southern side of the approach to Serpents Mouth. A patch of 4 to  $4\frac{1}{2}$  fathoms (7.3 to 8.2 m.) is charted  $81^{\circ}$  8 miles from it, with deep water close to the northward of it.

The 5-fathom (9.1 m.) curve is from 4 to 6 miles distant from the southern shore of the Serpents Mouth, whence it is said to decrease gradually toward the low delta of the Orinoco, but it has not been surveyed and should be given a wide berth. As reliable charts

are to be had of the northern side of this passage, it is advisable to favor it.

**Cuscuina River**, about 16 miles westward of the Macareo, is only suitable for canoes.

**Pedernales River entrance** ( $10^{\circ} 02' N.$ ,  $62^{\circ} 13' W.$ , *H. O. Chart 2319*) is situated about 34 miles westward of the Macareo River, and is used by small steamers when the weather is too rough for making the Macareo River. The British naval vessel *Panther* entered the Pedernales River in 1902, obtaining a least depth of 16 feet (4.9 m.) at high water springs. About a mile above Foletto Point is the settlement of the Pedernales Asphalt Co., off which is good anchorage in about 5 fathoms (9.1 m.), fine gray sand.

**Vagré River** is the western mouth of the Orinoco; it has a delta about 15 miles in breadth, with a principal entrance at either end; the eastern one, known as the Manamo Mouth, enters the Gulf between Foletto Point and Pesquero Island, in common with the Pedernales River, and is navigable for small vessels. The western entrance enters the gulf between Venado Island and the mainland westward of it, abreast the Caño de Cipa. In the estuary of Vagré River, between Venado Island and Foletto Point, are Cotoma and Pesquero Islands, with Vagré and Guanipa Islands off the southwestern shore; the space between them has not yet been surveyed.

**Gulf of Paria—San Juan River** ( $10^{\circ} 10' N.$ ,  $62^{\circ} 37' W.$ , *H. O. Charts 1810, 1811, 1812, and 1813*) is situated about 13 miles north-westward of Venado Island. It is about 5 miles wide at its entrance between Punta Arena and Tigre Point, 1 mile wide at Punta Gorda, from whence it gradually decreases in width as far as the town of Guanoco, where it is only a few yards wide.

**Depths—Maturin Bar**, in the approach to the entrance of San Juan River, has depths of 10 to 18 feet (3.0 to 5.5 m.) at a distance of 4 to 8 miles in a northeasterly direction from the northwestern extremity of Tigre Point; the fairway depth is about 16 feet (4.9 m.) at mean low water; steamer captains have reported that a vessel drawing 21 feet 2 inches (6.5 m.) has succeeded in getting over the bar by dragging through the mud; inside the bar the depths gradually increase until off Tigre Point, where there are depths of 24 to 36 feet (7.3 to 11.0 m.); the river then shoals slightly for a distance of about 3 miles, after which deep water is carried as far as Carner Point (which is marked by a signboard); from thence to Guanoco, a distance of  $3\frac{1}{2}$  miles, the depths in the center of the river vary from 10 to 30 feet (3.0 to 9.1 m.).

**Guanoco** is situated at the base of two hills, 350 and 250 feet (106.9 and 76.2 m.) high, on the right bank of the San Juan River and 39 miles above the entrance; it is connected with Le Brea by

railway. There is a large deposit of liquid pitch here. The principal trade is with Port of Spain and with the United States, by steamers carrying pitch. No provisions can be obtained and no water in the dry season.

**Guarapiche River** joins the San Juan River about 20 miles from its mouth, and it is navigable for large canoes to a considerable town on its banks, named Maturin.

**Buoys.**—There are nine red gasoline drums or casks which mark the starboard side of the channel when entering. A bell buoy is moored about 3 miles northeastward from the northern extremity of Tigre Point. A red buoy is moored  $1\frac{1}{4}$  miles north northwestward from Tigre Point. The positions of these buoys can not be relied upon.

**Tides.**—It is high water, full and change, at Punta Gorda at 4h. 33m., springs rise  $7\frac{1}{4}$  feet (2.2 m.), neaps rise  $3\frac{1}{4}$  feet (1.0 m.) (approximate); and at Guanoco at 7h. 15m., springs rise 12 feet (3.7 m.), neaps rise 7 feet (2.1 m.) (approximate).

**Directions.**—In approaching the bar and steering for the outer buoy keep two hills bearing about  $267^\circ$ ; having made the outer buoy, the course is from buoy to buoy as charted. When about 700 yards from No. 1 buoy, bearing about  $270^\circ$ , or with Tigre Point bearing  $172^\circ$  make good course  $185^\circ$ , to clear the shoal water which extends about 800 yards off the northwestern extremity of Tigre Point, and when past it leave Tigre Point about 800 yards on the port hand, after which keep in mid-channel, turning to the right at the junctions.

A steamer entering the river must stop and pick up a custom guard at a wooden hut above Punta Gorda.

In anchoring at Carner Point (marked with a signboard), a position about  $\frac{1}{4}$  mile above the point, in 60 feet (18.3 m.) midstream, appears to be considered the best by masters trading in this river. A 300-foot steamer will foul the banks in swinging, and it is always advisable to keep steam up to the capstan to assist in protecting the propeller and rudder from injury. Owing to the narrow breadth of the river above the junction of the Cicaro River, vessels turn at this point and are towed stern first to the wharf at Guanoco. A vessel of 280 feet length is about the limit that can make the turns when loaded. It is necessary to have five or six good lines ashore aft while lying at Guanoco, as the current is exceedingly swift.

**The western head** ( $10^\circ 26' N.$ ,  $63^\circ 00' W.$ ; *H. O. Chart 2319*) of the Gulf of Paria is about 25 miles northwestward of the entrance to San Juan River, with charted depths of about 4 fathoms (7.3 m.). On its southern shore between San Juan River and Antica Point are several islands, westward of which is a channel leading into

the San Juan. At the head of the Gulf is Turepano and other islands, northward of which the Chaguaramas River enters the Gulf.

**Guiria**, on the northern shore of the Gulf, is built on the beach. The church is a conspicuous object from seaward. About  $\frac{1}{2}$  mile northeastward of the customhouse there is a reddish cliff about 80 feet (24.4 m.) high, and  $1\frac{3}{4}$  miles beyond is a remarkable triangular-shaped red cliff, a conspicuous object from seaward.

Vessels moor off Guiria in a depth of 5 fathoms (9.1 m.), mud, and good holding ground, at about 1 mile from the shore, with the customhouse, situated on the beach close northward of the town, bearing about  $292^{\circ}$ .

Southward of Guiria the coast is low, and at 2 miles southward of a headland covered with trees it suddenly trends to the westward.

**Tarpa** is an anchorage on this coast, off a small river of that name, situated several miles west of Guiria.

**Punta Yara**.—At about 8 miles northeastward of Guiria is Punta Yara, between which and Cumana Point, about 8 miles farther eastward, three isolated shoals, about  $\frac{3}{4}$  mile and  $1\frac{3}{4}$  miles apart, are charted about a mile offshore.

**Eastward of Cumana Point** (*H. O. Chart 1005*) are the small bays, Pato, Cacao, Morocoi, Aricagua, Cariaquita, and Celeste, the latter being near Peñas Point, the northwestern extremity of the Gulf. The coast between Aricagua Bay and Peñas Point has reddish cliffs in places.

Garsa Rocks, 217 feet (66.1 m.) in height, extend nearly  $\frac{1}{2}$  mile offshore between Cariaquita and Celeste Bays.

Goose Island, off Cariaquita, is described with the Boca Grande. There appears to be no dangers off this coast beyond those mentioned.

**Aricagua Bay** is open and the anchorage only fit for coasters. A little to the eastward of Aricagua Bay, and at  $\frac{1}{4}$  mile from the shore, are the Patuca Rocks, 3 feet (0.9 m.) in height.

**Cristobal Colon**, the most eastern port in Venezuela, in the western portion of Aricagua Bay; is the port of entry for vessels bound for San Juan River. There is anchorage in 5 to 6 fathoms (9.1 to 11.0 m.) in the middle of the bay, just inside the two outer entrance points. Steamers anchoring too far out are liable to go adrift, as there are strong and irregular currents along the coast.

There is no wharf.

**Cariaquita Bay**, about 5 miles to the southwestward of Peñas Point, forms a snug anchorage for coasters. In the entrance there are depths of  $3\frac{1}{4}$  to 4 fathoms (6.4 to 7.3 m.), but the current runs

across it at times with some strength, rendering it unsuitable for other than small craft. On the western side of the inlet is a settlement and a stream of good water. The mosquitoes are troublesome.

**Peñas Point.**—The little promontory of Peñas, forming the northeastern extremity of the coast of Paria, is 980 feet (298.7 m.) high, and nearly separated from the mainland, being connected by a narrow ridge of land at the head of Celeste Bay, about 200 yards in breadth and 250 feet (76.2 m.) high, so that when seen from a certain distance northwestward and southeastward it has the appearance of an island.

**A rock, awash,** lies  $\frac{1}{4}$  mile off Peñas Point, the eastern extremity of the peninsula. As it always breaks, it may easily be avoided.

**La Islette,** 230 feet (70.1 m.) in height, lies off Mexillones Point, its northern extremity.

## CHAPTER VIII

### VENEZUELA—FROM THE GULF OF PARIA TO CAPE GALINAS

**COAST OF PARIA** (*H. O. Chart 2319*).—The name of Paria is given to the narrow mountainous ridge of land which bounds the northern side of the Gulf of Paria. These mountains which rise from the height of 2,000 (609.6 m.) to upward of 3,000 feet (914.4 m.), are covered with trees to their summits, and throw off large spurs to the northward and southward, which terminate at bold projecting points on both shores, forming deep gorges at the heads of the bays.

**Cape Tres Puntas** ( $10^{\circ} 45' N.$ ,  $62^{\circ} 44' W.$ ).—From Peñas Point the coast trends nearly due westward for 50 miles to Cape Tres Puntas, Mexillones Bay, 4 miles to the westward of Hermita Point, being the only indentation worthy of mention. This shore is bold, and a depth of 20 to 40 fathoms (36.6 to 73.2 m.) sandy bottom, will be found at 1 mile offshore. About 6 miles west of Peñas Point there is a peak 3,320 feet (1,011.9 m.) high and at 6 miles farther westward one of 3,500 feet (1,066.8 m.)

Soundings can be obtained at 30 to 40 miles from this coast, but this bank has never been thoroughly examined; consequently it is possible there may be shoals, though none are known.

There is a 15 fathom (27.4 m.) spot, whose existence is doubtful, 56 miles northeastward from Cape Tres Puntas.

**Unare Bay** ( $10^{\circ} 45' N.$ ,  $62^{\circ} 44' W.$ ; *Plan on H. O. Chart 2034*) lies between 2 and 3 miles westward of Cape Tres Puntas, affording good shelter from the trade wind; it is about  $1\frac{1}{2}$  miles in width. Morro or Point Northeast is foul for about 200 yards with the 3 fathom (5.5 m.) curve 400 yards off the point, and the western point has islets fringed by a reef extending off it; the shore between is a white sandy beach, with a stream in the middle of it.

There are a few scattered huts along the shore occupied by the laborers employed on the cocoa estates in the vicinity, named San Juan de Unare. The landing place is on the beach westward of the Morro, between two adobe huts, and there is generally surf enough to make landing disagreeable.

**Depths.**—The existing chart, which is said to be very inaccurate, shows uniform depths of from  $4\frac{1}{2}$  to  $5\frac{1}{2}$  fathoms (8.2 to 10.1 m.)



at from a half to 1 mile from the beach, but there is said to be a depth of 8 fathoms (14.6 m.) at about 1,500 yards offshore and 13 to 14 fathoms (23.8 to 25.6 m.) at 1 mile off.

There is a rise and fall of the tide of between 5 and 6 feet (1.5 and 1.8 m.)

**Cape Malapasqua** ( $10^{\circ} 43' N.$ ,  $63^{\circ} 02' W.$ , *H. O. Chart 2319*), known locally as Cabo Quarinta, lies  $17\frac{1}{2}$  miles westward of Unare Bay. The coast between recedes about  $3\frac{1}{2}$  miles, forming an exposed bay which has various indentations, with some rocks lying close to the points. It is otherwise free from dangers.

**Cumberland Bank**.—About 15 miles  $189^{\circ}$  from the southeastern extremity of Testigo Grande Islet, the water shoals suddenly to 5 fathoms (9.1 m.); this depth continues for 2 miles to the southward, when it deepens to 14 fathoms (26.5 m.). The full extent of the bank is not known.

**Daring Bank**.—About 10 miles  $196^{\circ}$  from the southwestern extremity of the Testigo Grande, the water shoals suddenly from 13 fathoms (23.8 m.) to  $5\frac{1}{2}$  fathoms (10.1 m.), sandy bottom. For 2 miles in a west-northwesterly direction from this position the depth gradually increases, and  $220^{\circ}$  from the same islet there are 15 fathoms (27.4 m.), and soon after no bottom with 20 fathoms (36.6 m.).

**Green Bank**, about 4 miles in diameter, with depth of from  $4\frac{1}{2}$  to 6 fathoms (8.2 to 11.0 m.) of water, lies about 6 miles south-southeastward of the southeastern point of Testigo Grande.

As the preceding shoals have never been thoroughly examined, large vessels should avoid them, for much shallower water may exist.

**Marinita**, the bight immediately westward of Cape Malapasqua, affords well-sheltered anchorage for small vessels in its eastern part.

**Coast**.—From Cape Malapasqua to Puerto Santo, a distance of 12 miles, the coast is bold and steep-to. About  $2\frac{1}{4}$  miles westward of the cape is a conspicuous rock about 200 feet (61.0 m.) high, near the shore. About 7 miles inland is Monte de Puerto Santo, a remarkable mountain, 3,470 feet (1,057.7 m.) high.

**Caribes Bay**, better known as Rio Caribes, is a small bay 7 miles westward of Cape Malapasqua. On this bay there is a flourishing town of about 2,000 inhabitants. Its principal industry is cocoa and dried fruit, but it has no customhouse. The bay affords anchorage for small vessels and landing is seldom impossible. The best anchorage is in 7 fathoms (12.8 m.) with the rock off Frayle Point just open of the rock off Caracoles Bight, and with the eastern point of Caribes Bay bearing  $135^{\circ}$ .

**Puerto Santo Bays** ( $10^{\circ} 44' N.$ ,  $63^{\circ} 11' W.$ , *Plan on H. O. Chart 2034*).—Morro del Puerto Santo is connected to the shore by a low narrow strip of sand about  $\frac{1}{2}$  mile in length; close off the western

extremity of the Morro there is a small islet also known as Puerto Santo. The northern sides of both and the western side of the islet may be approached to within  $\frac{1}{4}$  mile.

**Anchorage.**—In West Bay, off the western side of the sandy neck of land, which connects the Morro to the mainland, there is good anchorage, with the usual winds, in  $4\frac{1}{2}$  to 6 fathoms (8.2 to 11.0 m.) sand and mud, about midway between the islet and the main; taking care not to bring the islet to bear northward of  $23^\circ$ , unless in a vessel of light draft, for to the eastward the depth decreases suddenly to 3 fathoms (5.5 m.). East Bay is exposed to the prevailing trade winds.

**Coast.**—From Puerto Santo the shore trends west-southwest  $4\frac{1}{2}$  miles to Hernan Vasquez Point. Foul ground extends  $\frac{1}{2}$  mile offshore.

**Hernan Vasquez Point** (*H. O. Chart 1692*) is but one of a series of bluff points along this shore. The islets off this point are mere rocks, close inshore, and not as conspicuous as the chart tends to show them.

**CARUPANO BAY** ( $10^\circ 40' N.$ ,  $63^\circ 15' W.$ , *H. O. Chart 1692*).—The shore curves to the southward, forming Carupano Bay between Hernan Vasquez Point and Morro Jarro, a distance of  $2\frac{1}{4}$  miles across. The eastern part of the bay is known as Hernan Vasquez Bay, which provides an anchorage in from 4 to 6 fathoms (7.3 to 11.0 m.). The western part of the bay has a little less depth. Vessels roll heavily in this bay, especially when the trade wind veers to the northward.

**Aspect.**—In clear-weather months Puerto Santo and San Jose, situated on either side and behind the town, afford excellent landmarks for entering the bay. The high white church tower and the houses of the town are visible for some distance from seaward.

**Carupano Light**, occulting white, 216 feet (65.8 m.) above high water, visible 20 miles, is exhibited from an iron openwork tower 111 feet (33.8 m.) high that stands on Miranda Hill in the southwestern part of Hernan Vasquez Bay. (See Light List.)

**Dangers.**—A shoal having a least depth of  $2\frac{1}{4}$  fathoms (4.1 m.) over it, and whose position is doubtful, is charted about 1,250 yards  $105^\circ$  from Jarro Islet, close off Morro Jarro.

A shoal patch, having a least depth of  $2\frac{3}{4}$  fathoms (5.0 m.) over it and 275 yards in diameter, whose center lies about 1,225 yards east from Jarro Islet.

A shoal, having a least depth of  $2\frac{1}{4}$  fathoms (4.1 m.) of water and 200 yards in length in a north-northeasterly and south-southwesterly direction, lies 1,300 yards  $66^\circ$  from Jarro Islet. On the chart, the position of this shoal is marked doubtful.

A small shoal 50 yards in diameter, with  $1\frac{1}{4}$  fathoms (2.3 m.) least water, lies about 1,300 yards  $60^\circ$  from Jarro Islet.

A shoal patch, about 75 yards in diameter with about  $2\frac{3}{4}$  fathoms (5.0 m.) of water, the existence of which is doubtful, is supposed to lie about  $1\frac{1}{2}$  miles north-northeastward of Jarro Islet.

A dangerous rock with 4 feet (1.2 m.) over it lies about 625 yards  $325^\circ$  from Jarro Islet; a 3-fathom (5.5 m.) spot exists between this rock and the islet.

There are two shoal patches, each about 75 yards in diameter, with  $3\frac{1}{2}$  and  $3\frac{1}{4}$  fathoms (6.4 and 5.9 m.) over them, the existence of which are doubtful, are supposed to lie 1,050 and 1,450 yards north of Carupano Light.

A shoal patch, about 75 yards in diameter, with  $3\frac{1}{4}$  fathoms (5.9 m.) of water lies 850 yards west-northwestward from Carupano Light, just outside the 5-fathom (9.1 m.) curve.

**Anchorage.**—Vessels should anchor eastward of a line drawn  $345^\circ$  from the signal station on East Guayacan Point. There are 5 fathoms (9.1 m.) of water at 600 yards from Hernan Vasquez Point, and anchorage must be taken up in about 4 fathoms (7.3 m.) with Carupano Light bearing  $197^\circ$  distant about 1,000 yards.

Merchant vessels generally moor off the town, but the holding ground is not as good, as it is to the eastward; nor is the sea as smooth.

**Caution.**—The depths in Hernan Vasquez Bay are reported to be less than shown on the chart, and as the bay has not been thoroughly surveyed there may be other shoal spots than those mentioned.

**Tides.**—The tidal rise in Carupano Bay is about 2 feet (0.6 m.).

**Directions.**—Steer in with the southeast corner of the church in range with the Carupano Light, bearing  $200^\circ$ ; this leads between Hernan Vasquez Point and the shoals charted westward of it.

**CARUPANO** ( $10^\circ 40' N.$ ,  $63^\circ 15' W.$ ; *H. O. Chart 1692*), the principal port of the eastern section of Venezuela, appears to be huddled at the foot of some steep hills, but actually it stretches up the valley of two small streams which enter the sea here.

The town is extremely hot. It has a population of about 13,000.

The United States is represented by a consular agent.

**Wharves.**—There is a steel pier 820 feet long by 17 feet wide, equipped with two 5-ton hand cranes, with depths alongside its outer end of from 12 to 14 feet (3.7 to 4.3 m.).

Large vessels must discharge into the lighters, which are unloaded at the wharf.

There is also a wooden pier 210 feet long by 38 feet in width equipped with one 3-ton hand crane, for the use of coastwise traffic.

**Water.**—Good water can be obtained from the stream at the southeast corner of the bay, but the landing there is difficult on account of the surf.

**Communication.**—French and Dutch steamers formerly called regularly every month, and German steamers at uncertain times. Carupano is connected by telegraph with La Guaira and Curacao, and by submarine cable with Porlamar, Margarita Island.

**Telegraph cable.**—The cable of Porlamar is landed about 1,100 yards to the westward of the church.

**Quarantine.**—The health officer's visit must be awaited, the bill of health must be given to the health officer at the gangway. The customs officer and the health officer will only come on board after 7 a. m.

The customs officer is also the harbor master, and requests that the captains of vessels anchor near the customhouse to facilitate business.

**TESTIGOS ISLANDS** ( $11^{\circ} 23' N.$ ,  $63^{\circ} 07' W.$ ; *H. O. Chart 2319*).—About 44 miles,  $11^{\circ}$  from Carupano Light lies a group of islets known as the Testigos, which consist of seven principal islets, besides several high rocks. It is reported that these islands lie 3 miles farther south than charted.

The largest, Testigo Grande or Goat Island, is about 600 feet (182.9 m.) in height, and nearly 3 miles in length, northwest and southeast. It consists of three parts, the highest and largest portion of the island being the central; the two extremities of the island are connected to the central portion by low isthmuses; the northern one is sandy.

There are two islets off the northwestern extremity, one off the northeastern point, one off the southeastern extremity; an islet in the southwestern bight is connected to the shore by a reef. Southward of the northwestern extremity of the main island is a sandy beach, fairly steep-to.

Prickly pear and cactus grow all over the island, and many domestic goats may be seen. The southwestern group consists of three islets, the northern of which has a shallow bight with sandy beach on its eastern side.

Testigo Grande abounds in land tortoises and is inhabited from January until June by a colony of fishermen from Margarita Island, but there is no fresh water.

The passages between the islets are supposed to be free from danger, but the contrary is the case with the narrow channels between the rocks.

All the islets are reported to be clear of dangers beyond  $\frac{1}{4}$  mile except the northeasternmost, which is surrounded by a reef to the distance of  $\frac{1}{2}$  mile.

The group of islets situated about  $1\frac{1}{2}$  miles northeastward of Testigo Grande consists apparently of one large island, about 200 feet (61.0 m.) in height, with a patch of cultivated land on its western side, and a chain of three islets extending northwest from it.

**Anchorage.**—There is anchorage in about 20 fathoms (36.6 m.) with the summit of Testigo Grande bearing  $83^{\circ}$ , distant  $1\frac{1}{2}$  miles, and with the northern extremity bearing  $6^{\circ}$ ; also nearer the shore on the same bearing of the summit, in 17 fathoms (31.1 m.), with the northern extremity of the island  $357^{\circ}$ . The beaches on the western side afford good landing.

**Directions.**—In approaching the Testigos from the southward the southern end of Testigo Grande or Goat Island appear projected against the higher part of the island like a separate island. The northern anchorage may be approached either from the northwest or southeast; if from the former direction, a vessel must pass outside a rock lying off the northwest extremity of Testigo Grande; if by the latter, there is a passage between Testigo Grande and another islet lying southwestward of it; this channel at the narrowest part (between the rock at the eastern side of the little island and another about 200 yards from the southwestern coast of Testigo Grande) is  $\frac{1}{2}$  mile wide, with depths of  $8\frac{1}{2}$  to 9 fathoms (15.5 to 16.5 m.) on red gravel.

The current in the vicinity of these islands often runs with considerable velocity between west and northwest. In February its direction has been found even north-northwest and its velocity 2 knots. In July its velocity may be 3 knots and in August  $1\frac{1}{2}$  knots. It is necessary, therefore, to approach this group very cautiously in the night.

**Coast** ( $10^{\circ} 41' N.$ ,  $63^{\circ} 20' W.$ , *H. O. Chart 2319*).—The coast from Morro Jarro to Morro Blanco, distant 3 miles to the westward, forms another bay somewhat similar in shape to Carupano Bay, with a row of houses on the eastern part. There are several patches of rocks lying close to the shore. About 10 miles southward from Morro Blanco the peak of Monte de San Jose, 3,380 feet (1,030.2 m.) in height, may be seen. At about 13 miles inland and 11 miles southwestward of San Jose is the Redondo or rounded mountain, 1,315 feet (400.8 m.) high. This mountain having a perfectly rounded summit, is more easily recognized from the offing than either San Jose or Puerto Santo Mountains.

From Morro Blanco the coast trends westward 4 miles to Taquien Point, and thence 8 miles to Morro de la Esmeralda. All this part is foul, and should be kept at a distance of 2 miles. Between the two first-mentioned points is situated Padilla Point, known by an islet and several rocks near it. Taquien Point projects farther to the northward than Padilla Point and is also skirted by several islets. Immediately to the westward of Taquien Point is Puerto Escondido, but there is no information regarding it.

Lebranche Bay, which is situated 5 miles westward of Taquien Point, is joined to the mainland by a low, sandy, swampy tongue of land.

**Garrapatas Islets** lie from 1 to 2 miles from the coast between Point Lebranche and Esmeralda, but being obstructed by rocks and shoals there is no passage among them. There is said to be a good channel between the most southerly islet and the mainland about

600 yards wide, with a depth of 5 fathoms (9.1 m.); Esmeralda Island, bearing 255°, leads through, but it is better to keep outside them.

**Esmeralda Island** (10° 40' N., 63° 31' W., *Plan on H. O. Chart 2034*) is small but apparently of some height, as it is known as the Morro de la Esmeralda. A channel about 200 yards wide, much encumbered by rocks, separates it from the point of the same name.

**Esmeralda Bay**, westward of Esmeralda Point, is about 1½ miles wide, but shallow, there being a depth of 3 to 4 fathoms (5.5 to 7.3 m.) at about 1,500 yards offshore. Within this depth are the three small cays, known as Cascabel Islets, lying in an east and west direction.

**Caution.**—The 5-fathom (9.1 m.) curve is reported to be ½ mile farther offshore than charted.

**Anchorage.**—Esmeralda Island is bold and steep-to, and vessels may anchor about ¼ mile southward of it in about 4½ fathoms (8.2 m.), sand and mud; the western extremity of the island should not be brought to bear westward of north.

**The coast** (*H. O. Chart 2319*) trends westward from Esmeralda Bay for about 5 miles to Morro de Manzanillo; it is skirted at the distance of 800 yards by the shore bank, which extends from Esmeralda Island. About 2 miles westward of Morro de Manzanillo is a steep point. Westward for about 8 miles from this steep point the coast is apparently clear of danger to Point Guarapotura.

Near the Morro de Manzanillo on the shore line is a group of buildings consisting of two large low buildings with white walls, two smaller buildings a few hundred yards to the westward and a large house on the western slope of a deep valley which appears to run from the head of Cariaco Gulf to the north coast near Morro de Manzanillo.

**Guarapotura Rock** (10° 40' N., 63° 43' W., *H. O. Chart 2035*).—About 1,400 yards northeastward of Point Guarapotura lies a sunken rock that must be very carefully avoided. Between the rock and the mainland the shore is fringed with shallow water. A little eastward of this point and at about 2 miles inland will be seen the peak of a mountain known as Pico del Este.

**Coast.**—The coast takes a westerly direction from Point Guarapotura for about 3 miles to White Shield Point. It is steep and high with white cliffs in several places. From White Shield Point the coast trends northwestward for 2 miles and is low and swampy. The land then rises and forms a hilly promontory known as the Morro de Chacopata, about 2 miles in length. About 4 miles inland from White Shield Point are Cerro de Chacopata, 1,398 feet (426.1 m.) high, and Tetas de Chacopata.

**Chacopata Bay** ( $10^{\circ} 42' N.$ ,  $63^{\circ} 53' W.$ , *H. O. Chart 1062*).—This bay lies between the Morro de Chacopata and Caiman Point, 8 miles to the southwestward. The shore recedes considerably and the water is shallow. The shore bank, with depths of less than 3 fathoms, (5.5 m.), extends from off Morro de Chacopata to Caribes Islet, whence it turns to the southward, parallel to the shore to Caiman Point, where it is about  $\frac{1}{2}$  mile offshore.

Westward from Caribes Islet, 111 feet (33.8 m.) high, about 1 mile, is Lobos Islet, 113 feet (34.4 m.) high, with a small islet close eastward of it 74 feet (22.6 m.) high.

**Sapphire Shoal.**—At the eastern entrance of the southern channel, between Coche Island and the mainland, there is a most dangerous shoal of 15 feet (4.6 m.) of water, called Sapphire Shoal, which is 800 yards long, northwest and southeast, from which the Morro de Chacopata bears  $105^{\circ}$ , distant 2 miles, and the western end of Caribes Islet  $199^{\circ}$ , distant  $1\frac{1}{2}$  miles.

Local authorities state that this shoal is subject to frequent change.

**Channel.**—The depths in the passage southward of the shoal are irregular, and vessels drawing more than 20 feet (6.1 m.) should not attempt it.

Vessels should not use the passage between Sapphire Shoal and Coche Island, as irregular depths of 13 to 26 feet (4.0 to 7.9 m.) have been found in it.

**Anchorage.**—The chart shows anchorage in 5 to 6 fathoms (9.1 to 11.0 m.) 2 miles westward of Morro de Chacopata, or about 1,600 yards southeastward of Lobos Islet, but better shelter will be found off the southwestern side of Coche Island.

**Tuna Islets** (*H. O. Chart 2035*), three in number, lie in a  $347^{\circ}$  direction from Punta de la Tuna at distances of about 1,600 yards, 2 miles, and 2.9 miles, respectively; a rock which breaks at times lies 100 yards northeastward of the outermost islet. The islands are low, the middle one being the highest and shows white; the other two are brown. The passage between them is apparently clear, and between the innermost and the mainland is a depth of  $4\frac{3}{4}$  fathoms (8.7 m.).

**Coast.**—From Morro Caiman the coast trends westerly for  $7\frac{1}{4}$  miles to Punta Morro de la Peña and is moderately level, the only salient points being those of Tuna and the Morro del Castillo; it is fronted by shallow water to the distance of nearly  $\frac{1}{2}$  mile. At  $2\frac{1}{2}$  miles inland are the two peaks Cerro de Cariaco and Tetas de Cariaco.

**Salinas Bight.**—From the Morro de la Peña the coast is rocky for 3 miles to Punta Gorda, and from it a long, curved sandy beach, with Punta de las Minas, a rocky point, in the center, connects the

high eastern land with the peninsula Araya at Punta Guachin. This sandy beach recedes  $1\frac{3}{4}$  miles from the line connecting these points and forms Salinas Bight.

**Peninsula de Araya** ( $10^{\circ} 40' N.$ ,  $64^{\circ} 16' W.$ ).—From Punta Guachin the coast trends westward  $3\frac{1}{2}$  miles to Punta Escarceo or Eddy Point, the northern extremity of the little peninsula of Araya; this part is low and flat and fronted by shallow water to the distance of  $\frac{1}{2}$  mile. Punta Escarceo presents a front  $\frac{1}{4}$  mile in extent, the western extremity being known as Punta Cardon.

From Punta Cardon a low sandy shore bends round to the south-westward for  $2\frac{1}{4}$  miles to Punta de Araya; here are a few small houses inhabited by salt collectors.

**Araya Bank.**—From Escarceo Point Araya Bank extends to the westward at least 4 miles, when it sweeps in toward Araya Point and terminates at Chica Point. It is extremely dangerous, some of the heads on the outer part breaking in heavy breezes. The discolored water have been reported to the westward of Araya Bank, weather; it is, however, so steep to that there are 32 fathoms (58.5 m.) close alongside the shoals, and before a second cast of the lead can be obtained a vessel may be ashore; there is, consequently, no warning when approaching these dangers in the night. The bank is said to be extending to the westward. Breakers with discolored water have been reported to the westward of Araya Bank, as charted, in a position from which Escarceo Point bears  $80^{\circ}$

**Caution.**—Care is required in rounding Peninsula of Araya, as the banks off its western side may extend much farther than indicated on the chart.

Punta Escarceo, bearing southward of  $102^{\circ}$ , leads northward of Araya Bank; the western peak, Cerros del Macanao, on Margarita Island, 2,304 feet (702.2 m.) in height, bearing  $11^{\circ}$ , leads westward; and the houses on Punta Araya, bearing northward of  $90^{\circ}$ , lead southward of it.

**Coche Island** lies nearly in the middle of the passage, and is 6 miles long in a west-northwest and east-southeast direction, 3 miles broad, and about 200 feet (61.0 m.) high. The island is surrounded by a rocky ledge and reef that extends about 3 miles from the northwestern point and  $1\frac{1}{2}$  miles from the southeastern point. The northwestern end of Coche Island terminates in a dry, sandy spit, which extends from the body of the island in a northwestern direction  $1\frac{1}{4}$  miles. Off the northwestern end of the island and about  $\frac{1}{2}$  mile outside the 5 fathom (9.1 m.) curve is a 2 fathom (3.7 m.) spot. The bottom anywhere outside the skirting reef of Coche Island affords anchorage in case of need, but the best shelter will be found in 8 fathoms (14.6 m.) about 2 miles off the south-



western side of the island, or in 8 fathoms (14.6 m.) mud,  $1\frac{1}{2}$  miles off the sandy spit at the western end of Coche Island.

Coche Island, from a point 5 miles north of Morro de Chacopata, shows a fairly level sky line, tapering from approximately 200 feet (61.0 m.) in height on the north to a low point near the southeastern extremity. The high land shows a gray or slate-colored bluff facing to the eastward; the color changes to red toward the southeastern point.

A village is located on the extremity of the spit, extending north-westward of the island.

**Cubagua Island**,  $9\frac{1}{2}$  miles westward of Coche Island, is about 5 miles long in an east and west direction, 2 miles broad, and about 200 feet (61.0 m.) high. From the eastern end a reef extends about 1 mile, leaving a channel between it and the ledge off Mangles Point Margarita Islands, 3 miles wide, carrying 10 and 12 fathoms (18.3 and 21.9 m.). About 2 miles eastward of the northern point of the island a shoal spot of less than 4 fathoms (7.3 m.) is charted. The northern point has a ledge extending about  $\frac{1}{3}$  mile with a depth of 5 fathoms (9.1 m.) at that distance; otherwise it is steep-to, but on the western side a bank of rocks extends from  $\frac{1}{2}$  to 1 mile from it. Shoals of 5 fathoms (9.1 m.) are charted 2 and  $2\frac{3}{4}$  miles southwestward from the southwestern point.

**Shoals.**—Depths of  $3\frac{1}{2}$  and  $4\frac{1}{2}$  fathoms (6.4 to 8.2 m.) have been found 1 mile southward of Cubagua Island and 19 feet (5.8 m.)  $1\frac{1}{2}$  miles southeast of the southwestern point of the island.

Caution must be observed in navigating in this vicinity, as uncharted dangers may exist.

**Directions.**—From the eastward vessels should pass about  $\frac{1}{2}$  mile from the Morro de Chacopata, and thence steer direct for Lobos Islet, which is steep-to, bearing  $247^{\circ}$ .

In steering toward Tuna Islands from Lobos Islet the depth increases rapidly; Tuna Islands are steep-to and the channel between them clear; but it will be better to pass northward of the three islands, and from thence steer to pass about 2 miles northward of Punta Escarceo, Peninsula of Araya, and thence to observe the clearing marks previously given for avoiding Araya Bank.

This channel should not be navigated at night, and if there is not sufficient daylight left to carry a vessel to the westward of Araya Bank when bound to Cumaná, it will be better to anchor for the night under Coche Island, as the current is strong and variable.

As before mentioned, the channel northward of the Sapphire Shoal should be avoided.

**Coast.**—From Punta Araya the coast, a low, sandy beach, trends southward for 2 miles to Punta de Piedras, a bold headland having

a sea face of about  $\frac{1}{2}$  mile, formed by the western extremity of the high ridge, El Guaranache, over the southeastern side of the peninsula. On the southern side of the ridge stands a chapel dedicated to Nuestra Señora de Agua Santa.

Off the shore there are depths of 5 to 6 fathoms (9.1 to 11.0 m.) at the distance of  $\frac{1}{4}$  mile.

**Araya Bay** ( $10^{\circ} 35' N.$ ,  $64^{\circ} 16' W.$ , *H. O. Chart 2035*).—From Punta de Piedras the coast extends southward and recedes slightly to Punta del Barrigon,  $3\frac{1}{2}$  miles distant, forming a small bay on the western side of the low sandy part which connects Peninsula of Araya with the mainland. The coast is steep-to and may be approached to the distance of 200 yards and anchorage taken up anywhere.

Punta del Barrigon is lofty, and at a short distance within it the land rises to the height of 876 feet (267.0 m.); on the northern side of the point, where the land begins to rise, are the ruins of a castle.

There is a considerable village on the shore of the bay. On the northern shore of the bay there is a cove and landing place, with a large white building at the cove. Boats can probably be landed on any part of the beach.

The approach to Araya Bay can hardly be mistaken. The chapel shown on the chart is a small gray building, square, with a large arch or door way. The chapel is located on an almost level elevation north of the bay, while the southern point of the bay is marked by the ruins of an old fort. The fort stands on the edge of a precipitous yellow bluff.

**Punta de Arenas.**—From Punta del Barrigon the coast trends southeastward for 2 miles to Punta Caney, and thence 1 mile farther in the same direction to Punta de Arenas, the northwestern point of entrance to the Gulf de Cariaco. A shallow ledge extends  $\frac{1}{2}$  mile southward of it.

**Anchorage** will be found in 9 fathoms (16.5 m.), sandy bottom, about 1,500 yards west-northwestward of Punta Caney.

**MARGARITA ISLAND** (*H. O. Chart 2035*), a Province of Venezuela, consists of two mountains of rock, connected by a low, sandy isthmus about 10 miles long and from 60 to 180 yards broad; therefore when seen from only a short distance to the northward and southward it will appear as two islands. From the northward or southward the twin hills (Las Tetras) are excellent landmarks.

Its extreme length east and west is 37 miles, but its breadth varies considerably; the whole area is 444 square miles.

The eastern portion of Margarita Island, which is the larger, is 18 miles long north and south and about 14 miles broad; near the center Mount Margarita, in the Cerros de la Vega, rises to the height of 3,240 feet (987.6 m.) and may be seen from Cape Tres Puntas, a distance of about 75 miles. This part, however, is much broken, and contains several summits, having between them cultivated valleys. In one of these valleys, on the southeastern side of the Cerros, is Asuncion, the capital of the island. The port of entry is at Pampatar, in the eastern part of the island.

The western portion of Margarita Island is about 12 miles long east and west and 7 miles broad, and consists of nearly an unbroken mountainous mass of rock, known as the Cerros del Macanao, which form four peaks, on an east and west line, the highest being 2,304 feet (702.2 m.) above the sea. Population of the island in 1903 was about 49,000, the principal employment being pearl fishing.

**North Coast.**—From Cabo de la Isla, the northern point of the island, the coast trends southwestward for 7 miles to Punta de la Galera, which is high and bluff; this part is apparently free from danger.

**Galera Islet.**—At  $1\frac{1}{2}$  miles northeastward from this point is Galera Islet, which is covered with guano and very white, and between the point and the islet is found a depth of 14 fathoms (25.6 m.) over sand and shells.

**Manzanillo** is situated in a bight in the coast about  $1\frac{1}{2}$  miles southwestward from Cabo de la Isla. It forms the shipping point of the magnesite mines located in the vicinity. There is a small pier, available for small boats only, reported to be about 75 yards long, extending northwestward offshore from the base of the magnesite pile, which is to the left of the houses on the beach. Vessels use this pier as a mark, approaching within a ship's length, letting go the anchor and running a stern line to the pier. It is equipped with a small crane or derrick. The village consists of five or six houses and a few Indian huts, very near a patch of white sand beach. On either side of the beach there are bold, dark cliffs. In back of a saddle of mountains a few more white houses can be seen when standing in from the northwest. A current varying from  $1\frac{1}{2}$  to  $2\frac{1}{2}$  knots sets around Cabo de la Isla into the bight. The water in the bay is usually smooth.

There are two rocks on either side of the bay; the distance between the two is about 1 mile in a  $54^{\circ}$ – $234^{\circ}$  direction. A line of soundings between these rocks gave nothing less than 7 fathoms (12.8 m.). To find a good anchorage stand in from the northwest midway between the two rocks, heading for a pile of magnesite, and anchor in 6 or 7 fathoms (11.0 to 12.8 m.) of water from 300 to 500 yards from

shore. It is best to favor the western rock as there are a few just awash near the rock on the eastern side of the bay.

Northward of the bay is a small islet close to the shore called Morro de Buey, and to the southward are two small islands called Constanza Islands; they also are close to the shore. The bay appears, from the reports, to be free from shoals or rocks. The population consists of several hundred employees of the mining company.

Vessels are entered and cleared at Pampatar.

There are three lighters of 50 tons capacity. Labor is plentiful and cheap, and 400 tons of magnesite—the only export—can be put aboard in a day.

Supplies such as fish, fowl, mutton, eggs, and pineapples can be obtained at reasonable prices.

**Constanza.**—To the southwest of Manzanillo there is a small settlement with a pile of magnesite, a white sand beach, and a very good little bay called Constanza. There are remains of a small wharf there also. This settlement should not be taken for Manzanillo.

**San Juan Griego Bay** ( $11^{\circ} 05' N.$ ,  $63^{\circ} 59' W.$ , *Plan on H. O. Chart 2034*).—Southward of Punta de la Galera is situated San Juan Griego Bay,  $2\frac{1}{2}$  miles in width, between that point and Punta de Maria Libre on the south and receding  $1\frac{1}{4}$  miles from a line between the two points; it is skirted by a bank of less than 3 fathoms (5.5 m.) of water, which in the southern portions of the bay extends nearly  $\frac{1}{2}$  mile from the shore; at a little over that distance, and nearly in the center of the bay, is a rocky patch of 2 fathoms (3.7 m.) of water.

A white monument, on the first point southward of Point Galera and just to the northward of the village, shows up very well and makes a good landmark.

**San Juan Griego Light**, fixed white, 36 feet (11.0 m.) above high water, visible 3 miles, is exhibited from an octagonal masonry column 31 feet (9.4 m.) high on the shore near the Indian huts 2.4 miles  $70^{\circ}$  from the extremity of Maria Libre Point.

This light is easily confused with the lights of the village. (See Light List.)

**Anchorage.**—There is anchorage in this bay in 8 fathoms (14.6 m.), about 1 mile southwestward of Punta de la Galera, and also in from 4 to 5 fathoms (7.3 to 9.1 m.) about halfway between that position and the shore.

**North Bay.**—From San Juan Griego Bay to coast takes a southerly direction about 4 miles to the eastern extremity of the sandy isthmus which connects the two peninsulas of Margarita

Island; thence the sandy beach trends westward for 10 miles, and is generally 10 to 12 feet (3.0 to 3.7 m.) only above the sea, but there are a few scattered hillocks. The western extremity of the beach is swampy, and thence the shore trends northward for about 5 miles to Punta del Tunar, the northwestern extremity of North Bay.

North Bay is  $11\frac{1}{2}$  miles wide, and apparently free from danger, being only bordered by a bank with depth of less than 3 fathoms (5.5 m.), which at the widest part extends about  $\frac{1}{2}$  mile from the land. A reef with several rocky heads, extends  $\frac{1}{2}$  mile in a north-easterly direction from Punta del Tunar.

**Coast.**—From the Punta del Tunar the coast trends westward 8 miles to Tigre Point; it is free from danger at the distance of less than  $\frac{1}{2}$  mile until Tigre Point is reached. From Tigre Point the coast continues in a west-southwesterly direction for  $2\frac{1}{2}$  miles to Morro del Robledar, the northwestern extremity of Margarita Island.

Shoal water is reported to extend 1,000 yards northwestward from Tigre Point.

**West coast.**—From the Morro del Robledar the western coast of Peninsula de Macanao sweeps southward and southwestward for  $4\frac{1}{2}$  miles to Punta de Arenas, the western extremity of Margarita Island. In the bay between the Morro del Robledar and Punta de Arenas depths of less than 3 fathoms (5.5 m.) are found at 1 mile from the shore and 5 fathoms (9.1 m.) only at about  $2\frac{3}{4}$  miles.

**Ostial Shoal.**—The center of a rocky shoal known as Ostial Shoal lies  $5\frac{1}{2}$  miles  $318^\circ$  from Punta de Arenas and  $5\frac{1}{4}$  miles  $270^\circ$  from the Morro del Robledar; it has on its shallowest part  $4\frac{1}{2}$  fathoms (8.2 m.). This shoal is  $1\frac{3}{4}$  miles long in a west-north-west and east-southeast direction, and  $\frac{1}{2}$  mile wide. Between it and the Morro there are from 5 to 7 fathoms (9.1 to 12.8 m.), over sand and mud; to the northward and westward the soundings extend to a considerable distance, but to the southward and westward the bank is step-to.

It is recommended that steamers pass westward of the shoal.

**Southern coast.**—From Punta de Arenas the coast trends eastward for 12 miles to Punta del Pozo, the western point of Mangles Bay. As far as Morro Blanco, 3 miles from Punta de Arenas, the coast is apparently free of danger. The remaining portion is skirted by a shoal of less than 3 fathoms (5.5 m.) of water, extending in the eastern part to a distance of 1 mile from the shore.

**Mangles Bay** ( $10^\circ 56' N.$ ,  $64^\circ 10' W.$ ) is  $6\frac{1}{2}$  miles in width between Punta del Pozo and Punta de Piedras; the latter is a flat peninsula, covered with mangroves, with a village on it, and recedes

2¼ miles from the line of the points. The skirting bank of less than 3 fathoms (5.5 m.) attains a distance of 1½ miles from the shore in Mangles Bay, and on it are numerous detached patches of rock.

About 2½ miles northeastward of Punta del Pozo is the entrance to Laguna Grande or Arestinga, which is 10 miles in length from east to west and about 2 miles in breadth. The water in it is salt; at its eastern end stands the village of San Juan, not shown on chart.

**Guamache Bay** (*Plan on H. O. Chart 2035*).—Between Punta de Piedras and Punta de Mangles, a distance of 3 miles to the south-eastward, lies Guamache Bay. Punta de Mangles is a green projecting point.

This bay is about 1½ miles deep. The 5 fathom (9.1 m.) curve follows the eastern shore at about ¼ mile distance, then swings westward and is about ¾ mile off the north shore.

**Anchorage** can be picked up as convenient, as the soundings decrease from 8 to 10 fathoms (14.6 to 18.3 m.) fairly regularly to the shore; sandy bottom.

There is a town on the northwest shore of the bay.

**Shoal**.—A shoal having a least depth of 1½ fathoms (2.7 m.), upon which the S. S. *Haiti* stuck in 1922, is reported to lie 1 mile southward of Punta de Mangles. The position of this shoal on H. O. Chart 2035 is marked approximate.

**Coast**.—From Punta de Mangles the coast trends 10 miles to the eastward to Punta de Mosquitos, with Punta Carnero about midway between. It is foul to a distance of about 1 mile. Three miles westward of Punta de Mosquitos is the entrance to a small lagoon named Laguna Chica.

**Channels**.—The depths in the channels between Coche Island, Cubagua Island, and Margarita Island are very irregular. Northward of Coche and Cubagua, the deep-water channel between Punta Carnero and the foul water northward of Coche is 1¾ miles wide; while between Cubagua and Punta de Piedras it is 3½ miles in width.

As far as is known, these channels are clear except for the dangers charted on Hydrographic Office Chart 2035.

**Caution**.—These channels should be navigated with caution as other uncharted dangers may exist.

**La Mar Bay** (*10° 57' N., 63° 51' W., H. O. Chart 2146*).—From Punta de Mosquitos the coast trends northward and eastward to Morro de Punta Moreno, forming La Mar Bay; 6 miles wide and 2 miles deep.

**Porlamar Light**, flashing white, 56 feet (17.1 m.) above high water, visible 6 miles, is exhibited from a gray, octagonal, stone

tower, 52 feet (15.8 m.) high, east of the boat landing. (See Light List.)

**Shoals.**—The northern part of the bay is foul, and depths of less than 3 fathoms (5.5 m.) extend for a distance of about 1,500 yards, and of less than 5 fathoms (9.1 m.) for  $1\frac{1}{4}$  miles from the shore. A detached shoal of 3 fathoms (5.5 m.) of water 500 yards in length northwest and southeast and 250 yards wide lies with its northwest extremity  $160^\circ$  from the lighthouse.

**Telegraph cables.**—The cables from Carupano and Cumana are landed as a white cable hut located 1,400 yards westward of the light.

**Anchorage.**—Anchorage may be reached by standing in with Porlamar Light bearing  $355^\circ$  until the right tangent of Punta Moreno bears  $67^\circ$ , in  $4\frac{1}{2}$  fathoms (8.7 m.). Care must be taken not to anchor on the submarine cables. The chart also shows anchorage in about  $3\frac{1}{2}$  fathoms (6.4 m.) 400 yards inshore of the latter position.

**Tides.**—It is high water, full and change, at 4h. 00m.; springs rise 1.5 feet (0.5 m.) neaps range 1.2 foot (0.4 m.).

**Porlamar**, situated on the northern shore of the bay, is the principal town of the island, and is connected by cable with Carupano and Cumana. Near the center of the town is a large substantial building; the principal boat landing is near this building. Back in the town is a high chimney.

There is a radio station.

**Southeast coast.**—Between Morro Moreno, which shows from the southward as three humps, and Punta de la Ballena, the eastern extremity of Margarita Island, situated  $3\frac{1}{2}$  miles to the northeastward, the coast forms two small sandy bays, separated about midway by a rocky point.

**Port Moreno** ( $10^\circ 58' N.$ ,  $63^\circ 49' W.$ , *Plan on H. O. Chart 2034*), the southernmost of the two bays, is about  $1\frac{1}{4}$  miles deep and is said to be quite free from danger outside the reefs fringing the shore to a distance of 400 yards.

**Bahia Pampatar.**—On the shore of the northern bay is the town and castle of Pampatar, and on a rocky point to the eastward is the small fort, La Carranta, off which rocks extend about 400 yards; the bay otherwise appears to be free from danger.

The castle of Pampatar, of typical Spanish construction, is gray and massive as compared with the surroundings, and is surmounted by sentry boxes at the corners and angles. It is a good landmark. There is a large building of two stories near the center of the town and a church with two towers, Spanish type.

**Blanco Islet**, about 100 feet (30.5 m.) in height and very conspicuous, with dark base and white top (probably guano), is situated

1½ miles northeastward of Morro de Punta Moreno; it has a rock above water close off its northeastern end. From its southwestern end a ledge extends 200 yards to the westward; and a reef is said to extend from its southeastern side; the passage between it and Margarita has depths of 5 to 9 fathoms (9.1 to 16.5 m.).

**Pampatar Light**, fixed white, 229 feet (69.8 m.) above the water, and visible 8 miles is exhibited from a post 16 feet (4.9 m.) high, about 580 yards 17° from the center of Pampatar Castle.

**Anchorage.**—Anchorage is shown on the chart about 800 yards southeastward of Pampatar Castle. Both bays afford anchorage in 7 to 8 fathoms (12.8 to 14.6 m.), sand and shell bottom, anywhere, but the farther out and to the northward a sailing vessel lies better, in order to be able to weather Morro de Punta Moreno if forced to leave.

A convenient berth for getting to sea will be found in about 9 fathoms (16.5 m.), about 1 mile southeastward of Fuerte Carranta. As both of the above bays are completely exposed to the eastward, they are only safe for sailing vessels during light to moderate trade breezes, although it is said that not much sea is thrown in. In getting under way it is better to pass to leeward of Blanco Islet.

**Pampatar**, the town in the northwestern part of Pampatar Bay, has a custom-house and a small pier at which small vessels discharge. Cargo is handled by ship's gear. There are a few lighters of about 2 tons capacity available, but if necessary some of the vessels of the pearl-fishing fleet can be secured. Labor is plentiful and cheap.

**Supplies.**—Fish, fowls, eggs, pineapples, and mutton can be procured at reasonable prices.

**Coast.**—From Punta de la Ballena the coast extends 13 miles in a northwesterly direction to Cabo de la Isla, and is fringed by a shoal extending 600 yards to 800 yards from it. About 4 miles northwestward and 1½ miles inland is the Cerro del Balantia, rising to a height of 2,155 feet (656.8 m.). About 9 miles northwestward of Punta de la Ballena is Punta del Tirano, a well-defined light gray rocky point projecting nearly 1 mile northeastward and surrounded by rocks awash and visible, extending 200 to 400 yards. At 1 mile southward of Cabo de la Isla and ½ mile from the shore lies the northernmost of two islets, called Islas del Cabo, which are about 1,500 yards apart.

The coast from Punta de la Ballena to Punta del Tirano is well cultivated along the lowlands and partly cultivated on the slopes of the foothills. The country is dotted with farmhouses. A well-defined road leads inland from Punta Cardon to the 1,983-foot (604.4 m.) peak. Punta del Tirano is easily distinguished, being a rugged barren point of greenish-gray color. The coast northward of the point is a level sandy beach, while to the southward the coast line shows as a red bluff.



**OUTLYING ISLANDS—Los Frayles** ( $11^{\circ} 12' N.$ ,  $63^{\circ} 44' W.$ ; *H. O. Chart 2319*).—At 9 miles,  $80^{\circ}$  from Cabo de la Isla, Margarita Island, lies a group of small islets, 4 miles in extent north and south, known as Los Frayles or Friars. The southernmost islet is the largest and is about 300 feet (91.4 m.) high; they are said to be all bold and steep-to except the northernmost, which is surrounded by a reef to the distance of  $\frac{1}{4}$  mile. The larger islands are covered with shrubbery and small trees; the small ones and the outlying rocks are covered with guano.

On the southwestern corner of the largest or southwestern island there are about a dozen native huts. The inhabitants are probably goat herders or fishermen. The largest island has the appearance of being very rocky, and there are no white sand beaches along its shore.

About 2 miles northward of Los Frayles lie two dangerous isolated rocks 20 feet (6.1 m.) high, which render the approach from the northward dangerous during the night.

**La Sola Island.**—This solitary little islet is  $48^{\circ} 13'$  miles from the largest of Los Frayles and  $263^{\circ} 27'$  miles from the northern extremity of the largest islet of the Testigos Group, and is steep-to all around.

**Caution.**—In the passages between these islands it is supposed there are no dangers, but as that locality has not been surveyed extreme caution is necessary when navigating here.

**Los Hermanos, or The Brothers** ( $11^{\circ} 50' N.$ ,  $64^{\circ} 27' W.$ ).—About 40 miles nearly north of the northwestern point of Margarita Island lies the southernmost of a group of seven wooded islets, known as Los Hermanos, which occupy a space of 8 miles in a north-west by north and southeast by south direction. The three southernmost, the largest of which is called Pico, 570 feet (173.7 m.) high, lie close together and are separated from the others by a clear channel 3 miles wide. These islets belong to Venezuela and are uninhabited. The southernmost of the other four is named Orquilla; this is the largest, saddle-backed, and about 650 feet (198.1 m.) high. It is composed of granite boulders, between which grow cactus and grass in profusion. It is the home of the gannets, boatswain, and other sea birds. Most of them are high, bluff, conical rocks and when bearing  $115^{\circ}$  several of them may be seen above Blanquilla Island; they are all clear and steep-to, and there are no soundings in the passages between them. (See view 24, Appendix V.)

**Blanquilla or Blanca Island** ( $11^{\circ} 52' N.$ ,  $64^{\circ} 38' W.$ ).—This island, which was visited by Dampier in 1682, lies 8 miles westward of the northernmost of the Hermanos, is wedged shaped, 6 miles in length north and south by  $3\frac{1}{2}$  miles in breadth at its southern end.

At a distance it appears very low, flat, and uninteresting, but on a nearer approach it looks undulating, with clumps of trees and grassy downs from which blocks of weatherworn granite protrude. The eastern and southern sides have crusts of limestone coral overlying the granite. There is a lagoon on the southern coast which can be entered by a boat. The western coast for the most part is sand. The cactus abounds and the *lignum vitæ*, or guaicum tree, is common. Rocky ledges extend to the distance of 600 yards from the southwestern point and foul ground for about 400 yards off some parts of the western side and off the northern extremity. From the westward several of Los Hermanos will be seen over this island.

**Anchorage.**—There is anchorage in 18 fathoms (32.9 m.) at 1 mile from the northwestern coast of the island and in 6 to 7 fathoms (11.0 to 12.8 m.) at 600 yards from it, sandy bottom. Anchorage has been taken on the western side in (approximate) lat.  $11^{\circ} 51' N.$ , long.  $64^{\circ} 40' W.$ , in 17 fathoms (31.1 m.) hard white sand about 700 yards from the shore, with a house with red roof bearing  $94^{\circ}$  distant 945 yards. The beach is said to be clear of obstructions. The best anchorage is farther to the southward and 500 yards from the shore. There is a grove of coconut trees near the beach, abreast of the anchorage, but the water is slightly brackish, though used by the inhabitants. Good anchorage has been found by a steam yacht about half way along the southern coast opposite a small and picturesque cove. There is a white house with red roof and some small cultivated fields in this cove; the only signs of habitation on the island. The cove is reported by the natives to be clear of rocks and that anchorage may be had within about 400 yards from the beach. There is a spring cemented in, at this cove.

**Reported Shoals.**—Two small patches of shoal water, whose position on the chart is approximate, have been reported. One lies about 20 miles southward and the other 30 miles southwestward of Blanquilla Island. As this area has not been carefully surveyed other shoal patches may exist.

**Gulf of Cariaco** (*H. O. Chart 2035*).—This gulf is about 30 miles long east and west and 8 miles broad at its greatest breadth, which is near the middle.

The entrance between Carenero and Arenas Points is  $2\frac{3}{4}$  miles wide.

Punta de Arenas is foul to the distance of about  $\frac{1}{2}$  mile. Carenero is steep-to at the extremity, but between it and Baxa Point, which is eastward, distant  $4\frac{1}{2}$  miles from it, and thence to Morro Blanco, about  $2\frac{1}{2}$  miles to the southeastward, the shore is skirted by a rocky

ledge to the distance of nearly 1 mile, which is steep-to; elsewhere the shores of the gulf are clear, safe, and bold.

**Anchorage.**—The water is too deep for anchoring in most places in the gulf until within 7 miles of its head, where there are depths of 15 to 20 fathoms (27.4 to 36.6 m.), sand and mud.

**Laguna Grande del Obispo** ( $10^{\circ} 35' N.$ ,  $64^{\circ} 03' W.$ , *Plan on H. O. Chart 2304*).—On the northern shore of the Gulf of Cariaco, about 10 miles eastward of Arenas Point, is a small cove known as Laguna Chica, and at  $1\frac{1}{2}$  miles farther eastward there is another of much greater extent named Laguna Grande del Obispo, the entrance to which is  $\frac{1}{4}$  mile wide, with a depth of 12 fathoms (21.9 m.) in mid-channel; within the entrance the lagoon extends  $1\frac{3}{4}$  miles in an east-northeast direction and 1 mile in a westward direction but is too narrow to admit of turning room for any but small vessels. There are 10 to 16 fathoms (18.3 to 29.3 m.) over muddy bottom, and almost all the dangers are visible; neither of these places nor the gulf itself is of any importance to navigation, and they are consequently seldom visited.

**Coast.**—The plain on the southern shore of the Gulf of Cariaco extends about 10 miles inland to the foothills of the Cerro del Bergantin, which, 25 miles south of the entrance to the gulf, rises to a height of 4,935 feet (1,504.2 m.). Situated about 29 miles southeastward of Carenero Point is Pico de Camaracoa, 6,560 feet (1,999.5 m.) high.

**CUMANA** ( $10^{\circ} 28' N.$ ,  $64^{\circ} 12' W.$ , *H. O. Chart 990*).—Puerto Sucre, the port of Cumana, is situated 1 mile to the southward of Carenero Point. It is an open roadstead, but is sheltered from the prevailing northeasterly trade winds.

**Depths.**—From Carenero Point to the southern mouth of the Manzanares, about 1 mile distant, the shore is foul to about 400 yards distance, and from thence to Punta Piedras, a coarse sand bank, with depths of 1 to  $2\frac{3}{4}$  fathoms (1.8 to 5.0 m.) extends from the shore, its outer extremity being 1 mile west-northwestward of Morro Colorado. The depth then increases very rapidly and the 10 fathoms (18.3 m.) curve is about 200 yards off the sand bank.

**Aspect.**—On this plain is a group of isolated hills, and on the northwesternmost, which is only 1 mile within Carenero Point, stands at about 180 feet (54.9 m.) above the sea, the castle of San Antonio, which protects the town of Cumana lying on its western side; this hill, however, is commanded to the eastward by a more lofty summit. A little below the castle, on the southwestern slope, stand the ruins of the castle Santa Maria.

Rio Manzanares flows through the town, separating it from its western suburbs, thence discharging into the sea by two mouths; the northern branch is known as the Boca de Santa Catalina; the western outlet is only navigable for canoes, but in the rainy season small vessels ascend it to the town.

The shore from the western mouth of the river trends southward for about 2 miles to the Morro Colorado, or Escarpardo Rojo, a little hill with a red cliff, and thence southwestward 2.4 miles to Punta Piedras, and is sandy. About 1,500 yards eastward of the latter point was the entrance to the Rio Bordonos, but it is now apparently silted up.

San Antonio Castle is an excellent mark from seaward; it is a large rectangular structure with white foundation and yellowish-brown upper works. The electric street-lighting system extends up into the hills beyond the castle. (See view on H. O. chart 990.)

**Cumana Light**, fixed white, 79 feet (24.1 m.) above high water, visible 12 miles, is exhibited from a white square iron framework tower, with a red hood, standing on a concrete base, 70 feet (21.3 m.) high, erected near the customhouse on the southern side of the road leading to Cumana.

**Telegraph cables.**—The cables from Porlamar and Guanta are landed near the northern side of the ruined fort at the mouth of the Rio Manzanares.

**Anchorage.**—The anchorage off Cumana is confined to the space abreast the customhouse, and the best position is within 400 or 600 yards of the shore in about 16 fathoms (29.3 m.) of water, rocky bottom, for outside this the depth increases suddenly, especially to the northward of the fort.

It will be better to steady the vessel with a kedge or stream anchor to the southwestward or toward the shore. The wind generally blows from the land, but there is often a land and sea breeze, the latter setting in from about west-northwestward.

Vessels of less draft than 16 feet (4.9 m.) can go alongside the pier.

**Tide.**—The rise of the tides at Cumana is 4.5 feet (1.4 m.).

**Directions.**—The southern side of a mountain in range, 87°, with the clock towers of the church westward of Castillo San Antonio, leads to the anchorage.

Sailing vessels in working in must not stand farther to the southward than to bring the Castillo San Antonio to bear 78°, to avoid the bank off the red cliff mentioned.

**CUMANA** (10° 28' N., 64° 11' W.; H. O. Chart 990) is the capital and chief port of entry of the State of Sucre, and is about 1 mile from the coast. The customhouse and other buildings connected with the trade of the port are situated at Puerto Sucre on the shore abreast the anchorage and westward

of the town, with which it is connected by a mule car line. Having suffered greatly at different times from earthquakes the houses in the town are generally low, except along the water front, where there are a number of buildings of considerable size; it has several churches, two or more convents, and a theater.

The population in 1926 was 18,373.

**Pier.**—There is a small pier, 825 feet long and 18 feet wide, with 13 to 16 feet (4.0 to 4.9 m.) of water at the end.

**Supplies.**—Fish, wild fowl, and other necessities can be obtained, but are expensive.

**Water** may be obtained from the middle branch of Rio Manzanares, but it will be necessary to proceed  $\frac{1}{4}$  mile up the river before taking it.

**Climate.**—The weather is intensely hot from June to October, the temperature being usually from  $90^{\circ}$  to  $95^{\circ}$  during the day, and seldom so low even as  $80^{\circ}$  at night. It is, however, very healthful generally, the autumn being the least so.

**Hospital.**—There is a hospital which will accept seamen as patients.

**Coast—Puerto Escondido** ( $10^{\circ} 25' N.$ ,  $64^{\circ} 17' W.$ , *H. O. Chart 2319*).—From Punta Piedras the coast, in some parts bold and in others fronted by a sandy beach, trends west-southwestward for  $3\frac{1}{2}$  miles to Puerto Escondido. The port is merely a bay 600 yards wide at the entrance and about  $\frac{1}{2}$  mile long. In the middle of it there are depths of  $4\frac{1}{2}$  fathoms (8.2 m.) over sand, but nearer the shore only from 2 to 3 fathoms (3.7 to 5.5 m.); off the western entrance point rocks extend above 200 yards.

**Campanarito Bay.**—From Puerto Escondido the coast trends in a westerly direction, for  $1\frac{1}{2}$  miles to Punta Campanarito, not shown on the chart, and is bold and free from danger, with the exception of a sunken rock, which lies 100 yards from the shore, and 400 or 600 yards to the westward of Puerto Escondido. From Punta Campanarito to the Vigia, or signal tower of Mochima, the distance is about 1,500 yards; in this space the coast forms Campanarito Bay, with depths varying from 5 to 16 fathoms (9.1 to 29.3 m.), which will be found within 20 yards of the shore. A few rocks extend to the northward and westward about 100 yards from Punta Campanarito.

**Port Mochima** ( $10^{\circ} 25' N.$ ,  $64^{\circ} 20' W.$ , *plan on H. O. Chart 2034*).—The Vigia, before mentioned, stands about  $\frac{1}{2}$  mile eastward of the eastern entrance point of Port Mochima, which is one of the best harbors on this coast. The entrance is nearly 1 mile wide, but  $\frac{1}{2}$  mile within it narrows to 600 yards, and  $\frac{1}{4}$  mile farther in to 400 yards, in a short channel leading to the inner basin. The port is about 4 miles in length, north and south, and the shores are indented with several coves, which are mostly bold and deep.

In the southwestern angle of the bay is a very narrow channel leading to Tigrillo Bay.

**Depths.**—The depths are regular, deepening from 3 to 4 fathoms (5.5 to 7.3 m.) at 200 yards from the shore to 14 to 20 fathoms (25.6 to 36.6 m.) in the middle. Though the chart shows some foul

ground, especially in the southern portion of the bay, all the dangers lie close to the shore, and are easily avoided by the eye.

**Anchorage.**—The most convenient temporary anchorage will be found in either of the two coves nearest to the entrance on the eastern side of the harbor, outside the narrows, mooring with a hawser to the shore. A sailing vessel may proceed to sea from either of these places with the usual sea breeze; but from the anchorage within the narrows, it will be necessary to await the land wind, which generally comes off toward evening.

**Water may** be obtained from the Rio Mochima, near the head of the port on the southern shore. It is not, however, a convenient place, but by clearing away the obstructions which collect a little above the mouth, enough might be procured for a few small vessels.

**Manare Bay** (*H. O. Chart 2319*) is situated about 1 mile westward of Port Mochima, and is also an excellent port. The entrance is spacious, the shores are free from danger, with depths of 4 to 14 fathoms (7.3 to 25.6 m.) at 100 yards from the land; sailing vessels may pass in and out with the sea breeze.

**Tigrillo Bay.**—From Manare Bay the coast takes a southwesterly direction for  $1\frac{1}{2}$  miles to Punta Tigrillo, from which a reef extends 100 yards. Thence it sweeps around southward and eastward for  $2\frac{1}{2}$  miles, and then returns to the westward for  $5\frac{1}{2}$  miles to Punta Gorda, forming Tigrillo Bay, the inner part of which, as before mentioned, is connected with the southwestern part of port Mochima.

**Caraca Islands.**—In the entrance of Tigrillo Bay there are three islands; the easternmost is known as Venados, the middle one as Caraca del Este, and the third as Caraca del Oeste.

From Campanaria Point, the northern extremity of Venados, a rocky ledge extends 200 yards and from the southwestern end of the same island a shallow bank extends 200 yards; elsewhere the shores, both of the bay and islands, are considered free from danger and steep-to. The channels between the islands are narrow, but they are navigable for vessels of moderate draft and afford sufficient room for anchorage if necessary.

**Caraca Shoal** is a rocky shoal about  $\frac{1}{2}$  mile in extent from east to west, which lies  $1\frac{1}{2}$  miles northwestward from the Caraca del Este. A rock with an estimated depth of 17 feet (5.2 m.) over it has been reported between Caraca Shoal and Caraca del Oeste. It is situated about 800 yards northeastward of Caraca del Oeste.

**Picuda Grande Islet.**—About 2 miles to the westward of Caraca del Oeste, and  $2\frac{3}{4}$  miles northwestward from Punta Gorda, there is an islet named Picuda Grande, about 1 mile in length. About 400 yards from its eastern extremity there is a sunken rock, and off its northeastern point are two dry rocks, respectively, 200 and 600 yards distant. Elsewhere the shores are steep-to.

**Gulf of Santa Fe.**—The entrance to this gulf is between Punta Gorda and Escarpado Rojo, or Red Cliff. The gulf extends inland in an easterly direction for about 6 miles; its shores are free from danger, but at the entrance, about 800 yards from the northern shore, there are rocks which should not be approached within 400 yards; the depths in the gulf are from 23 to 36 fathoms (42.1 to 65.8 m.) muddy bottom.

**Cruz Bay.**—From Escarpado Rojo the coast inclines to the southward for  $1\frac{1}{2}$  miles, and then to the westward for 1,500 yards to Punta Cruz, forming Cruz Bay, which is clear of danger and affords excellent anchorage.

About 4 miles inland, southward of the bay, is Pico de Santa Fe, 3,372 feet (1,027.8 m.) high.

**Arapos Islands** lie about 1,600 yards westward of Punta Cruz, and extend to the westward about  $1\frac{1}{2}$  miles. The passage between the easternmost and the coast is deep and free from danger, but the islets are connected by a shallow bank and reef, which is impassable. Off the western side of the western islet there are two rocks which are steep-to.

**Coast.**—The coast from Punta Cruz trends westerly 4 miles to Punta Comona, the western limit of the Province of Cumana. The whole of the shore between these points is free from danger beyond the distance of about 200 yards.

**Comona Bay.**—Between Punta Comona and Punta Pertigalete, which lies 2 miles westward from it, the coast forms a fine bay, with 12 fathoms (21.9 m.) of water at 200 yards distant from the shore. It is free from danger, except in the eastern part, from which a reef extends 200 yards from the shore. Two small streams force an entrance into it through the sandy beach at the head of the bay.

**Monos Island or Guaracaro** lies in front of Comona Bay, about 600 yards northward of Punta Pertigalete, leaving a clear channel between, with 45 to 50 fathoms (82.3 to 91.4 m.) of water close up to the island. A rock and a reef lie about 400 yards from the northern side of the island; the channel between is clear, with depths of 25 fathoms (45.7 m.) and in sailing through it will be best to keep the island aboard.

**Outlying Islands.**—Between Punta Comona and Morro de Barcelona are several small islands and rocks extending to a distance of from 3 to 7 miles from the land.

**Chimana Islands.**—**Picuda Chica**, lying about 2 miles northward of Monos Island, is of a circular shape, about 600 yards in extent, and steep-to.

**Chimana del Este**, the most eastern of these islands, is smaller than Picuda Chica, and steep-to, is 1 mile south-southeastward from

Picuda Chica, and nearly the same distance northward of the rock off Monos Island.

**Chimana Segunda** ( $10^{\circ} 18' N.$ ,  $64^{\circ} 37' W.$ ), about 2,800 yards in length, and 375 feet (114.3 m.) in height and covered with cactus and scrub, is 2 miles westward from the above islet. Eastward of it are two small islets 90 and 353 feet (27.4 and 107.6 m.) high, respectively, the nearest lying about 200 yards and the other 1,000 yards from it; off the western side is another islet, distant about 200 yards; about 80 yards  $206^{\circ}$  from this western islet there is a rocky shoal with a least depth over it of 3 fathoms (5.5 m.).

**Chimana Grande**, lying westward of Chimana Segunda, with a channel 400 yards in width between the two, is about 4 miles in length. The eastern end is bare rock, 450 feet (137.2 m.) in height.

On approaching the channel between Chimana Grande and Chimana Segunda the small island in the center of the channel at first appears as a part of Chimana Grande. It is a wedge-shaped rock, with the thin edge to the westward. In the morning the eastern face reflects the morning light quite brilliantly. Its height is about 35 feet (10.7 m.). It is a good point to head for when approaching the channel, when near enough in to make it out.

The cliffs along the northern face of Chimana Grande are steep and rugged, with landslides. The island is covered with small trees and shrubbery above the cliffs. The strata seen close to are, on near approach, of a peculiar formation, being in some places truly vertical. Near the channel there is a large sharp wedge of rock, very noticeable, formed by a section of the strata having broken away from the wall of rock. Chimana Segunda is covered with a great deal more shrubbery than Chimana Grande, but has no cliffs, the vegetation coming down to the water's edge.

**Shoal.**—A shoal depth of 10 feet (3.0 m.) is located about 100 yards  $138^{\circ}$  from the southeastern extremity of Chimana Grande.

**Chimana del Oeste**, about 800 yards to the westward of the above, is joined to it by a sunken ledge of rocks and sand, extending about  $\frac{1}{2}$  mile to the northward of the northern extremity of Chimana Grande. On this ledge and midway between these two islands there is an islet, and a short distance to the eastward of it there is another.

**Chimana del Sud**, about 2 miles in length and 370 feet (112.8 m.) in height on the northeastern end, is separated from the southeastern end of Chimana Grande by a channel about 300 yards wide, with a depth of over 20 fathoms (36.6 m.) mud bottom; also from Punta Bergantin by a passage  $\frac{1}{2}$  mile wide, and the only known danger here is the reef which extends about 200 yards from the point; there is an appearance of shoal water for about 1,000 yards off the western side.



Between Chimana Grande and Chimana del Sud there are several islets, all steep-to.

**Borracha Island**, lying about  $2\frac{3}{4}$  miles westward of the Chimana del Oeste, is rather more than 2 miles in length by  $1\frac{1}{2}$  miles at its greatest breadth. The eastern and northern sides are free from danger, but from the northwestern part a shallow, rocky bank extends to a considerable distance, having on it several small islets, the most westerly of which must be passed at the distance of at least  $\frac{1}{2}$  mile.

This island shows up quite distinctly and makes a good landmark. It has a central peak the slopes of which rise at about 30 degrees from its side. There are several other minor peaks to the southward and westward of the island which do not stand out as well. The island is arid and has a grayish color. The island may be plainly distinguished from a distance of 40 miles at sea from a point to the northwestward, south of Tortuga Island.

**Borracho and Borrachitos Islets.**—From the southern extremity of Borracha a large sand bank extends about 3 miles about south-southwest, and on it are Borracho and Borrachitos Islets. The first lies close to Borracha; the others, which are two very small islets, are 2 miles from Borracha. There is no passage between any of them, and the southernmost, Borrachitos, which is peaked and has the appearance of a sail, should not be approached within 600 yards.

**Pertigalete Bay** ( $10^{\circ} 15' N.$ ,  $64^{\circ} 35' W.$ ).—At  $1\frac{1}{2}$  miles to the westward of Punta Pertigalete is Punta Guanta, and between them is Pertigalete Bay, with several small islets, and a shoal in the center; a stream discharges into it. Punta Pertigalete is foul on its western side to the distance of about 100 yards.

**Directions—Anchorage.**—Vessels entering this bay from the eastward must give Punta Pertigalete a berth of at least 200 yards, and also be careful not to get westward of the most easterly part of the northern islet, to avoid the shoal in the bay. A good berth will be found in  $4\frac{1}{2}$  fathoms (8.2 m.), about 300 yards from the beach on the eastern side of the bay, northward of the mouth of the stream.

**Guanta Harbor** ( $10^{\circ} 15' N.$ ,  $64^{\circ} 36' W.$ , *H. O. Chart 1324*).—From Punta Guanta the coast trends westerly 3 miles to Punta Bergantin, and between them, about 1 mile from the former point, is the harbor of Guanta, in the outer part of which lie several islets and rocks, with narrow but navigable channels between them. This harbor, the port of Barcelona, is almost landlocked; it is about 1 mile in length, north and south, with a maximum breadth of  $\frac{1}{2}$  mile.

**Depths.**—In Little Passage there is 6 to 8 fathoms (11.0 to 14.6 m.) of water; in Grand Passage, 13 to 18 fathoms (23.8 to 32.9 m.); and in Northwest Passage, 7 to 11 fathoms (12.8 to 20.1 m.). The

depth in the harbor varies from 5 to 14 fathoms (9.1 to 25.6 m.), mud; the western part is somewhat encumbered with shoals; the eastern shore is fairly steep-to.

**Landmark.**—The customhouse, a large stone building, forms an excellent leading mark, being easily distinguished from all other buildings on account of its size and height.

**Pitahaya Island Light**, fixed white, 62 feet (18.9 m.) above high water, visible 6 miles, is exhibited from a conical framework structure with a square base, 30 feet (9.1 m.) high, on Pitahaya (Tourblanche) Island in the entrance to the harbor.

**Light.**—A fixed red light 12 feet (3.7 m.) high is shown from the end of the demolished pier.

**Shoals.**—Off the eastern entrance point a shoal, on which are three small islets (Long Island), extends 350 yards northwestward; 100 yards northward of the outer end of this shoal is a small detached shoal surrounding Round Islet, 17 feet (5.2 m.) high; the passage between is called Little Passage. In the western part of the entrance is a shoal over 400 yards in length, north and south, on which are Pitahaya, 31 feet (9.4 m.) high; Center, 3 feet (0.9 m.) high, and South Islets.

**Entrance channels.**—Grand Passage, between Round and Long Island on the port hand in entering, and Pitahaya Island, on the starboard hand, is 200 yards wide at its northwest point. It is the best channel for entering the port.

Northwest Passage, between South Island and Meta Point on the mainland, is 75 yards wide.

Little Passage, between Round Island and Long Island, joins Grand Passage eastward of Pitahaya Passage.

**Anchorage** can be selected as convenient. There is little or no tidal current and ships usually ride to the prevailing wind.

The space in the harbor is too restricted to permit of more than one large ship lying inside, unless ships are moored bow and stern.

Outside of the harbor proper, the safe anchorage room is unlimited but there are no provisions for handling cargo.

A mooring buoy is moored 250 yards 34° from the customhouse.

**Telegraph cables.**—The cables from Carenero and Cumana are landed at a hut about 350 yards westward of the customhouse.

**Tidal currents.**—There is little or no tidal current in the harbor, ships usually riding to the wind. Off the entrance the current usually sets to the east-northeastward, but this is frequently checked by the sea breeze. The tide rises about 2 feet (0.6 m.).

**Directions.**—Coming from the northward or eastward the best approach is between Chimana Grande and Chimana Segunda, and from the westward between Chimana del Sud and the mainland.

The best and deepest entrance to the harbor is the Grand Passage, between Pitahaya and Round Islets, the chart being sufficient guide.

**GUANTA.**—The town of Guanta consists of a few mud houses near the customhouse.

**Wharf.**—Near the customhouse is the wharf, which, while formerly 900 feet long, has, through the collapsing of the ends, decreased to a length of about 500 feet. This wharf has a depth alongside its southeastern end of 20 feet (7.9 m.) and at its northwestern end there is 22 feet (6.7 m.) alongside.

Cargo must be unloaded and loaded by ships gear.

A coaling wharf was in the course of construction on the opposite side of the harbor (1924).

**Supplies.**—Beef and bread are obtainable in small quantities, but vegetables are practically unobtainable; fish are plentiful. Water may be obtained from pipe lines on the dock, but it is not suitable for drinking.

**Coal.**—Only a small quantity is kept in stock; when necessary a train brings the coal from the mines, and it is delivered directly from the trucks to vessels alongside the wharf.

**Communication.**—Guanta is connected by railway with Barcelona and by telegraph cable with Carenero and Cumana.

**Bergantin Bay** ( $16^{\circ} 15' N.$ ,  $64^{\circ} 39' W.$ ; *H. O. Chart 2319*).—From Punta Bergantin a reef projects about 200 yards and extends about 1 mile to the southward. Off the southwestern side of the point there is an islet with foul ground between it and the shore; from thence the coast continues in an easterly direction, forming Bergantin Bay, the southern side of which is also foul.

**Pozuelos Bay.**—From the western extremity of Bergantin Bay the coast sweeps southwestward and westward for about 4 miles, thence northward for 1 mile, terminating at the Morro de Barcelona. The bay thus formed is known as Pozuelos, and is  $4\frac{1}{2}$  miles wide; the land is everywhere very low and fronted by a sandy beach, which is skirted by a shallow bank to the distance of about 1 mile. Vessels should therefore not come within the depth of 7 fathoms (12.8 m.) sandy bottom.

**Barcelona Bay** ( $10^{\circ} 11' N.$ ,  $64^{\circ} 43' W.$ ; *H. O. Chart 1505*).—**Morro de Barcelona** is a remarkable, narrow, hilly peninsula, 446 feet (135.9 m.) high, about 1 mile in length from north to south, connected to the mainland, in an easterly direction, by a narrow low ridge of sand of about the same length. The northern extremity of the Morro is steep and bold, but the western side should not be approached to within  $\frac{1}{4}$  mile, as there is a rock awash lying nearly that distance offshore.

**The bay.**—Between the Morro and Punta Maurica, a distance of  $3\frac{1}{4}$  miles, is Barcelona Bay, but the Rio Neveri, emptying into the bay by several mouths, discharges such a quantity of sand and mud that a shallow bank, on which the sea breaks heavily, has formed across the whole bay, and the traffic which formerly used the river has gone to Guanta.

Old Spanish Port is the northern bight of the bay,  $1\frac{1}{4}$  miles wide and recedes about 1,500 yards. It has a maximum depth of 3

fathoms (5.5 m.), mud and sand bottom, in the center of the entrance.

**Anchorage.**—The best anchorage for vessels in the bay is in about 5 fathoms (9.1 m.), with the rock off the Chimana del Oeste open to the westward of the Morro de Barceloni. Those of light draft may possibly go farther in.

**Landing.**—Near the customhouse, a large white house on the beach close southward of Pueblo Guzman Blanco, situated on the left bank of the closed southern branch of Rio Neveri, landing can generally be effected.

**Town.**—About  $1\frac{1}{2}$  miles inland, on the western bank of the Rio Neveri, stands Barcelona, with a population of about 7,000. The town is lighted by electricity.

**Communication.**—It is connected with Guanta by rail, as before stated, and also with Naricaul, situated inland and 20 miles south-eastward of Barcelona. There is also telegraphic communication with all parts of the Republic.

**Piritu Islands** (*H. O. Chart 2319*).—About 14 miles southwestward from Borracha Island and  $3\frac{1}{2}$  miles from the mainland are two small, low, sandy islands, with some mangroves on them, named Piritu, from which reefs extend about 300 yards. There is a passage between the two islands, but it is hazardous to attempt, for the reefs on either side leave a channel only 400 yards wide with 5 fathoms (9.1 m.) of water. The passage between them and the mainland may be freely navigated, attention to the lead being all that is required.

**Coast.**—From Barcelona Bay the coast takes a westerly direction for about 33 miles to Punta de Unare, situated on an island formed by a lagoon, 8 miles in length east and west and about 3 miles wide. The highest point of the island is a small hill called Morro de Unare, and 7 miles to the eastward of it and a little more inland is the Morro de Piritu, 1,568 feet (477.9 m.) high.

With these exceptions, the whole of this coast is very low, and a flat of sand with gradually increasing depths extends all along the shore, and at the distance of about 5 miles there are depths of 12 to 15 fathoms (21.9 to 25.6 m.). The 100 fathom (182.9 m.) curve is stated to lie about 22 miles from the land, nearly midway across to Tortuga Island, but the soundings on the chart are insufficient to corroborate this.

**Unare River.**—This river flows into the southwestern corner of the above-mention lagoon. It is navigable for boats for a distance of 80 miles.

**TORTUGA ISLAND** ( $10^{\circ} 56' N.$ ,  $65^{\circ} 19' W.$ , *H. O. Chart 2319*) the eastern extremity of which is 48 miles westward of Arenas Point, Margarita Island and about the same distance northward from Morro de Unare, is somewhat oval in form, 12 miles in length from east to west, and about 5 miles in breadth near the middle. The eastern part is about 100 feet (30.5 m.) high, the western is low, and both terminate in distinct points.

The northern shore, from Punta Oriental in latitude  $10^{\circ} 54' N.$ , longitude  $65^{\circ} 13' W.$ , the eastern extremity of the island, to Punta Delgada, and from thence to Punta de los Ranchos, is free from danger, with the exception of rocky ledges, which extend about  $\frac{1}{4}$  mile from Puntas Oriental and Delgada. Between Punta Oriental and Punta de Piedras, on the southern shore, there are several small islets lying a short distance off, inclosing a sound, El Carenero, apparently only available for boats. Westward of Punta de Piedras the coast is bold and steep-to. On the southern side of Punta de Arenas, the western extremity of the island, there is a small village.

Tortuga from a distance of 5 miles appears generally arid and sandy. The small islands inclosing the carenage on the southern shore appear to be sandy and covered with dense green vegetation. To the west of Puerto Oriental there is a series of low cliffs. There are several green clumps of trees on the western end of the southern shore, two of which are very prominent.

**Islets.**—Off the northwestern shore of Tortuga Island, between Punta Arenas and Ranchos, there are several islets and foul ground, which necessitates attention to the lead. The first westward of Punta Ranchos is Anguila Cay, which lies about  $\frac{1}{2}$  miles from the shore, with shoals within it. The next west, known as Herradura Cay or Horseshoe Cay, is about 1 mile from the shore, with a navigable channel between for those acquainted with it; from the northeastern part of this cay a rocky ledge extends westward about  $\frac{1}{4}$  mile. Tortuguillos, the westernmost, are two small islets lying close together, also about 1 mile offshore, and encircled by a shallow bank.

A depth of 19 fathoms (34.7 m.) has been reported at  $2\frac{1}{2}$  miles northwestward of Tortuguillos, which gradually increased to no bottom at 90 fathoms (164.6 m.), when  $4\frac{1}{2}$  miles westward of Punta de Arenas.

**Anchorage.**—The only anchorage is between the shore of Tortuga Island and the Tortuguillos; it may be entered either from the northward, passing between the eastern Tortuguillo and Herradura, or from the southwestward between the former and Punta Arenas; the only precaution required is not to get into a less depth than 6 fathoms (11.0 m.).

**Caution.**—These islands should not be approached at night, as the low level character of the land makes it invisible until very close aboard.

**Coast.**—From Punta de Unare the coast trends west-northwestward 53 miles to Higuerote River; it is all very low and swampy, without any elevation whatever. Several small rivers reach the sea within this space, the principal of which are the Orquilla, Capira, Tuy, Paparo, and Higuerote.

**Lago de Tacarigua.**—About 36 miles westward of the entrance of the Unare is the entrance to Lago de Tacarigua, which is 15 miles in length by more than 6 miles in breadth, and contains a great variety of fish. It is separated from the sea by a narrow strip of low land, over which in one place the sea breaks at high water. Its depth does not exceed 4 fathoms (7.3 m.).

**Tuy River** is about 154 miles in length, and after draining the principal valley of the coast range of mountains, falls into the sea about 5 miles westward of Lago Tacarigua; it is navigable for boats for about 68 miles.

**Higuerote River** lies about 8 miles northwestward of the Tuy River and about  $2\frac{1}{2}$  miles from Carenero. The railway from Carenero to Rio Chico passes through Higuerote.

**Higuerote River Light** ( $10^{\circ} 29' N.$ ,  $66^{\circ} 05' W.$ ), fixed white, 33 feet (10.1 m.) above high water, visible 8 miles, is exhibited from a wood and masonry tower 13 feet (4.0 m.) high, at Higuerote River.

**Carenero Harbor** (*H. O. Chart 1511*) lies within and southward of Cape Codera, and is only open to southeasterly winds. The entrance is about  $\frac{1}{4}$  mile wide between Point Cruxada and the coral reef which extends 500 yards off the western shore. The port of Carenero is not open to trade.

**Depths.**—The entrance has depths of from 4 to  $5\frac{1}{2}$  fathoms (7.3 to 10.1 m.); within the reef the depths are from 3 to 4 fathoms (5.5 to 7.3 m.) shoaling to 2 fathoms (3.7 m.) toward the head of the bay.

**Anchorage.**—The shore of Carenero Harbor is low, but to the westward there is some remarkable table-land, which, by being brought to bear  $248^{\circ}$  or  $236^{\circ}$ , will lead a vessel to the anchorage; a convenient berth lies with Cape Codera bearing anywhere between  $0^{\circ}$  and  $11^{\circ}$  and distant about 2 miles from the shore, in about 6 or 7 fathoms (11.0 to 12.8 m.) or farther in according to draft.

There is also anchorage in about  $5\frac{1}{2}$  fathoms (10.1 m.) mud, about 400 yards westward of Point Cruxada.

**Railway pier.**—There is a railway pier on the western side with a depth of about 2 fathoms (3.7 m.) alongside.

**Carenero Light**, a private fixed white light, 26 feet (7.9 m.) above high water, visible 5 miles, is exhibited on the roof of the railway station when a vessel is expected.

**Beacons.**—A small wooden post, 4 feet (1.2 m.) high, marks the edge of the reef on the western side of the entrance. There is also a post, 75 feet (22.9 m.) high, 250 yards southeastward of the railway pier.

**Tides.**—It is high water, full and change, at Carenero Harbor at 10h 00m; mean high water springs rise 2 feet (0.6m.).

**Supplies.**—Fresh provisions are obtainable, but only in small quantities, and are expensive. Fresh water can be obtained at the railway pier.

**Communication.**—Carenero is connected by railway with Rio Chico, about 20 miles to the southward, via Higuerote, and by telegraph cable with La Guaira and Guanta.

**Cape Codera** ( $10^{\circ} 34' N.$ ,  $66^{\circ} 05' W.$ , *H. O. Chart 989*) is a well-known headland on the mainland, 43 miles  $237^{\circ}$  from Punta de Arenas, the western point of Tortuga Island. The cape forms a round hill, and has an islet or rock close off its western extremity (West Point); it is steep-to, there being a depth of 9 fathoms (16.5 m.) at 100 yards distance.

**Corsarios Bay**, westward of Cape Codera, is nearly  $2\frac{1}{4}$  miles in width between West Point and Point Caracoles and about 1,500 yards to its head on the eastern side. Its head for about 800 yards is low, sandy, and swampy; to the westward of this as far as Point Caracoles, the shore is foul to the distance of 100 yards; the point has a small rock close to and a reef that extends 200 yards beyond.

**Anchorage.**—Close under and within Cape Codera there is anchorage in about 7 fathoms (12.8 m.) sand and shells, at 400 yards from the shore; in using it a sailing vessel should bring up as soon as she is within shelter from the wind.

**Centinella Islet** (*H. O. Chart 2319*), about 14 miles  $354^{\circ}$  from Cape Codera, is about 70 feet (21.3 m.) high and from the northern side has the appearance of a white sail. It is steep on the eastern side with a gradual slope to the westward.

There is deep water all around the island except on the northern side, where there are some rocks, variously described as sunken, marked by breakers, and above water. These rocks are about 600 yards offshore with deep water between them and the islet.

**ORCHILLA ISLAND** ( $11^{\circ} 48' N.$ ,  $66^{\circ} 10' W.$ ; *H. O. Chart 1698*) lying northward 74 miles from Cape Codera, is about 8 miles in length, east and west, by 1 mile in breadth; it is generally low and flat, but on the northern side are three hills, separated by low valleys,

the highest of which, named Mount Walker, about 400 feet (122.0 m.) in height, is near the western extremity, which is bold; they may be seen when 15 miles off, and when first sighted from the northward or southward appear as islands. The mountains of Caracas may be seen from it in clear weather.

It has been reported that this island is incorrectly charted; as vessels have found it necessary to keep about 3 miles off the line of hills in order to give the southern shore an offing of 1 mile. This may be due to either the incorrect position of the shore line or of the hills

**Farallon**, a rock 10 feet (3.0 m.) in height, lies 300 yards off the narrow western extremity of the island, with deep water between.

**Mosquito Key**,  $2\frac{1}{2}$  miles in length, lies parallel to and to the northward of Orchilla Island, separated by a strait about  $\frac{1}{4}$  mile in width.

A shoal, with depths of 3 fathoms (5.5 m.) and under, extends about 500 yards from the northern end of the key.

When a vessel is sighted the Venezuelan ensign is displayed from this end of the key on the site of a former beacon.

**Storm Key**, about  $1\frac{1}{2}$  miles in length, lies to the westward of Northeast Key, the channel between their northern points, 800 yards in width, being the entrance to Orchilla Harbor.

A reef extends 300 yards northward of the beacon, 15 feet (4.6 m.) in height, on the northern point of Storm Key.

**Sand, Stone, Salt, and Water Keys** lie westward of the southern extremity of Storm Key. Water Key, about 1,500 yards in length, lies close westward of Salt Key, and westward of it is a line of detached rocks 1,500 yards in length, parallel and close to the main island.

**Anchorage.**—On the southwestern side, near the western end of Orchilla Island, there is a clean, white, sandy beach, which can be seen in clear weather from a distance of 10 miles, in front of which there is well-sheltered anchorage from the trade wind, in 6 or 7 fathoms (11.0 or 12.8 m.) at about 600 yards southwestward of some houses.

**Orchilla Harbor**, with depths of 15 to 24 feet (4.6 to 5.5 m.), lies between Northeast and Storm Keys, the entrance is from the northward, and is narrowed outside to 400 yards in width by the shoals off the northern ends of Northeast and Storm Keys. At the southern extremity of the harbor are a number of isolated reefs extending across from east to west.

The water inside the harbor is very clear, and the bottom can be seen at any point.



**Anchorage.**—Good anchorage can be obtained in this harbor, by small craft, in about 15 feet (4.6 m.), near the houses of the American Salt Co., which are situated on the northern end of Northeast Key; larger vessels could find anchorage in depths up to 24 feet (7.3 m.).

**Wharves.**—There are two wharves here belonging to the salt company. Some fishing huts are situated on the southern side of Storm Key.

**Buoys.**—There are two buoys in the harbor, one off the houses and one off the point about the middle of the southwestern side of Northeast Key.

**Directions.**—A sailing vessel should approach Orchilla Island from the eastward, steering for Mount Walker, on about a  $258^{\circ}$  bearing, until about  $\frac{1}{2}$  mile from Northeast Key, thence following the shore boldly round to the northward and westward and rounding the northern point of Northeast Key, according to draft, steer in for the anchorage off the wharves. The harbor is said to be free from dangers other than those marked on the chart, but it is advisable to get local assistance when entering.

Should a sailing vessel get to leeward of the entrance, she would experience much difficulty in beating up against the wind and the prevailing westerly current of  $1\frac{1}{2}$  knots.

**Supplies.**—No provisions can be obtained here.

**Water.**—Schooners land on the southern end of the island to secure water, but the water is not considered very good.

**Bank** ( $11^{\circ} 49' N.$ ,  $66^{\circ} 20' W.$ , *H. O. Chart 2319*).—A depth of 9 fathoms (16.5 m.) was found about 6 miles westward of the western end of Orchilla Island. The color of the water suggests shallower water may exist on this bank, which is 2 miles in length, north and south, by  $\frac{1}{2}$  mile in width.

A vessel passed 2 miles southeastward of the position of the 9 fathom (16.5 m.) patch without seeing it, and at 1 mile north-northwestward of Farallon had no bottom at 60 fathoms (109.7 m.).

A depth of 12 fathoms (21.9 m.) lies about 7 miles north-northeastward of the northern point of Northeast Key, Orchilla Island.

**Discolored water.**—Two patches of discolored water have been reported to exist  $6\frac{1}{2}$  and  $13\frac{1}{2}$  miles, respectively,  $145^{\circ}$ , from the Farallon, western point of Orchilla Island.

**LOS ROQUES** ( $11^{\circ} 58' N.$ ,  $66^{\circ} 41' W.$ , *H. O. Chart 2319*) is the name given to a large group of cays belonging to Venezuela, situated on a dangerous reef, occupying a space 13 miles in extent north and south and 24 miles from east to west. They are all low, with the exception of El Roque, which is 386 feet (117.7 m.) high and lies at the northern extremity of the group, the western part of which is.

chiefly formed of limestone hills, which may be seen from a distance of 12 to 15 miles in clear weather.

Vessels bound from St. Thomas to La Guaira generally pass between Orchilla Island and Los Roques; but this requires care, and had better not be attempted at night.

**Cayo Grande**, the southeasternmost islet, is the largest of the group, its southeastern point is 21 miles, westward from the western extremity of Orchilla Island. It is of triangular shape, 7 miles in length east and west and 6 miles north and south; the southern side is skirted by a reef, and from the eastern side a dangerous reef stretches between 2 and 3 miles, and continues to the northwestward toward Northeast Key.

**Cayo de Sal**, which lies close to the western end of Cayo Grande, is very narrow, but 7 miles in length from east to west. To the northwestward and northward of this cay, for a space of 10 miles, there are a great number of smaller islets, without any passage between them, and the surrounding reef is steep-to.

**Blackmans Cay** (*Plan on H. O. Chart 2034*), which indicates the edge of the reef southward of Porto el Roque, lies  $3\frac{3}{4}$  miles southward of El Roque. It first appears like a single large rock, but is really a low islet covered with bushes.

**Cays**.—About  $2\frac{1}{2}$  miles northward of Blackmans Cay is Pirate Cay and in the vicinity are Namans, Northeast, and French Cays. All these cays are fringed by reefs and appear to be formed of a bed of sand over a coral foundation, which is scantily clothed with the samphire plant; some have salt marshes, skirted by mangroves and dwarf trees.

**El Roque**, the westernmost and largest of the group of cays inclosing Porto el Roque, is nearly 2 miles in length east and west by about 1,500 yards in breadth at its eastern end. As already stated, its western part is formed of limestone hills of moderate height; stone is quarried here and used for lime and building purposes at Curaçao.

There is a small settlement on the southeastern side of El Roque Island. The inhabitants are engaged mostly in fishing and making charcoal. Water can not be obtained.

**Los Roques Light**, flashing white, 277 feet (84.4 m.) above high water, visible 16 miles, is exhibited from a square concrete tower, 60 feet (18.3 m.) high, on the easternmost peak of the island.

**Porto el Roque** is an excellent anchorage, secure against all ordinary winds, at the northern extremity of Los Roques, inclosed by the group of 7 or 8 cays already described occupying a space about 4 miles in extent east and west, and  $2\frac{1}{2}$  miles north and south. The depth in the port is 12 to 14 fathoms (21.9 to 25.6 m.).

**Channels—Depths.**—There are five channels into Porto el Roque. Northeast Channel, between French and Northeast Cays, is 600 yards wide, with depths of 8 and 9 fathoms (14.6 to 16.5 m.); Northwest Channel, between French Cays and El Roque, is 500 yards wide, with from  $4\frac{1}{2}$  to 6 fathoms (8.2 to 11.0 m.); Southwest Channel between El Roque and Namans Cay, is 600 yards wide and 10 to 15 fathoms (18.3 to 27.4 m.) in depth; Pirate Channel, between Namans and Pirate Cays, is too narrow to be of much practical use, being only 100 yards in width, but carries 8 to 13 fathoms (14.6 to 23.8 m.) of water; South Channel, the widest and best, is  $\frac{1}{2}$  mile wide between Pirate Cay and a dry sand bank to the eastward, with depths of 12 to 15 fathoms (21.9 to 27.4 m.).

A patch of 5 fathoms (9.1 m.) has been reported in the approach to Northeast Channel,  $65^\circ$  from the western extremity of Northeast Cay, distant about 1,800 yards.

**Anchorage.**—Off the southwestern side of El Roque there is good anchorage in 17 or 18 fathoms (31.1 or 32.9 m.) about 600 yards from the beach, but, being to leeward of a swamp, it is unhealthful. It will be far better to proceed in to the port. Vessels can anchor almost anywhere in the port in from 12 to 14 fathoms (21.9 to 25.6 m.); but the best anchorage is in the center of the eastern part in about 13 fathoms (23.7 m.), where a vessel will have the advantage of the pure sea breeze.

**Tides.**—It is high water, full and change, at Porto el Roque at 4h. 30m.; springs rise 3 feet (0.9 m.).

**Currents.**—The current in the vicinity of Los Roques is extremely variable both in direction and force, and the changes sometimes take place suddenly. Its velocity has been known to change quickly from  $\frac{3}{4}$  of a knot to even 3 knots.

During the summer—the period of light winds—the velocity of the current between these cays and Triste Gulf seldom exceeds 1 knot, and is often less; indeed, the natives assert that it frequently sets strongly to the eastward for many days together, which enable vessels to work up very rapidly.

**Directions.**—The edges of the reefs surrounding the various cays are said to be so distinctly seen that the plan, aided by the eye, is sufficient guide. As, however, but few soundings have been taken, the plan must be used with caution. It is more prudent for a stranger to pass outside or northward of El Roque and work up southward of it to the South Channel. In doing this Blackmans Cay, described above, is a useful mark.

**Supplies—Water.**—There is a well of water at the southern end of El Roque, but the supply is uncertain, and it never yields more than 80 gallons a day. Water may also be procured by digging wells in the sand, but it is brackish.

The dwarf trees on the island are suitable for firewood, but it should be barked before taking it on board, and, indeed, this should always be done in these seas, for green wood with the bark on is undoubtedly a source of sickness.

Fish may be caught in abundance, either by the seine or hook, and there is a fishing establishment on El Roque.

**ISLAS DE AVES, or BIRD ISLANDS** ( $11^{\circ} 58' N.$ ,  $67^{\circ} 28' W.$ ; *H. O. Chart 2319*), the scene of the total destruction of the French fleet under Admiral D'Etrees, in 1678, are two groups of small, low cays lying upon dangerous coral banks. They are covered with deposits of phosphate and sand. In the largest there is a salt-water lagoon. Fish abound, and turtle visit these cays; there are also numerous sea birds.

**Ave de Barlovento**, the eastern bank, is about 5 miles in extent and situated about 30 miles westward from the westernmost of Los Roques.

**Ave de Sotavento**, 9 miles farther westward, is 6 miles in length north and south by about 4 miles in breadth; an approach to either Ave de Barlovento or Ave de Sotavento is dangerous, especially from the northward, and both should be avoided.

**MAINLAND** (*H. O. Chart 2319*)—**Coast.**—The coast, which extends 10 miles northwestward from Caracoles Point to Maspa Point, is skirted by a reef, which extends 1 mile off Maspa Point, terminating at Chuspa Point; this part of the coast should not be approached within 2 miles. From Maspa Point the coast extends in a general westerly direction for 39 miles and with few exceptions is bold and steep-to and is bounded by the base of the lofty wooded mountains of Caracas.

**Mountains.**—From Caracoles Point the coast westward as far as La Guaira is formed by the great mountain ridge of Caracas, which in most parts rises abruptly from the shore and at only a short distance inland reaches an elevation of between 3,000 and 4,000 feet (914.4 to 1,219.2 m.). About 10 miles inland from Maspa Point, Monte Caculo rises to the height of 7,430 feet (2,264.7 m.).

**Chuspa Bay** ( $10^{\circ} 37' N.$ ,  $66^{\circ} 21' W.$ ).—Between Chuspa and Curuao Points, Chuspa Bay is apparently free from danger and the anchorage good; the only guide required for entering is the lead, but in approaching from the westward Sabana Bank will have to be avoided. From Chuspa Point the coast trends southwestward  $1\frac{1}{2}$  miles to the entrance of the Chuspa River; on its eastern bank, at about  $\frac{1}{4}$  mile inland, stands the town of that name. About  $1\frac{1}{2}$  miles westward of Chuspa is Curuao Point and town.

**Sabana Bank.**—From Curuao Point to Punta del Fraile, 4 miles farther to the westward, about 200 yards off which is a small rock, the shore is foul to the distance of 400 yards. Between Curuao and Fraile Points there is a projection of the land named Sabana, and about 1 mile northward of it lies the southern edge of Sabana Bank, rocky and 1 mile in extent; the general depths over it are from 4 to 8 fathoms (7.3 to 14.6 m.), but there is said to be as little as  $2\frac{1}{2}$  fathoms (4.6 m.) in places.

Maspa Point, bearing southward of  $90^\circ$ , leads northward, and Curuao Point, bearing westward of  $180^\circ$ , leads eastward of Sabana Bank.

**Naiguata Point**, about 20 miles westward of Punta del Fraile, is low and ill defined, but it may be known by a coconut plantation on it, which shows out well from the eastward or westward; there is also a conspicuous red clay slope to the eastward, which has some huts and a white church with a red roof below it.

Caraballera Point, about 6 miles farther west, has cultivated land, principally cane, on its eastern slope.

**Caracoles Bight**,  $2\frac{1}{4}$  miles westward of Punta del Fraile, affords anchorage for small vessels, and may be recognized by a conspicuous rock, 100 feet (30.5 m.) high, off its western point.

**Mountains.**—The most conspicuous mountain peaks on this part of the coast are the Pico Aguda de Cares, 32 miles westward from Cape Codera, and about 10 miles inland; the Pico de Naguata, 10 miles farther to the westward, 9,480 feet (2,889.5 m.) high; La Silla de Caracas, 8,500 feet (2,590.8 m.) high, about 4 miles to the northwestward of the latter; and lastly, Monte de Avila 7,070 feet (2154.9 m.) high, about 3 miles southeastward from La Guaira. (See view 26, Appendix V.)

**Macuto** is the village in the small bay about 3 miles eastward of La Guaira; it is protected on the western side by a small fort. There is good anchorage all over the bay, and the depths are regular in approaching the watering place. The depth is 20 fathoms (36.6 m.) at about 1,500 yards from the shore, with the street close by the watering place, open or end on, and the eastern entrance point a little open of the point westward of it.

In standing in toward the village, keep the watering place in line with the northwestern corner of the chapel, and the highest coconut tree over the eastern angle of the fort.

**Supplies.**—This is a convenient place for obtaining wood and water, the latter being conveyed to the beach through iron pipes.

**LA GUAIRA** ( $10^\circ 37' N.$ ,  $66^\circ 56' W.$ ; *H. O. Chart 1349*), the principal port of Venezuela, and the port for Caracas, the capital of Venezuela, is an artificially constructed harbor on the north coast.

**Depths in approach.**—Outside the harbor observations show a slight though decided tendency toward shoaling from the 6 or 7 fathoms (11.0 or 12.8 m.) line out to a depth of 15 fathoms (27.4 m.). At the same time the sea is encroaching on the land both east and west of the town. Considerable accumulation of sand has taken place on the outside of the breakwater from the shore end, but it does not extend beyond the former 4 fathom (7.3 m.) course, the sand dropping down at a steep angle to the natural sea bottom.

The area of sheltered water is about 80 acres, with an average depth of from  $4\frac{1}{4}$  to  $5\frac{1}{4}$  fathoms (7.8 to 9.6 m.).

**The harbor—Depths.**—The effect of the breakwater has been to produce an eddy current which has slightly deepened the middle and west parts of the harbor, the material so removed being deposited at its eastern end. In the eastern portion the depth decreases to about 2 fathoms (3.7 m.) close to the quays.

**Landmarks.**—In approaching La Guaira from the northward or eastward, a light green clearing with some high chimneys about 4 miles to the eastward of the harbor, and more especially the long, white masonry one-story building of the leper quarters, just west of El Canton show up conspicuously against the dark background for a great distance. The white cathedral tower of the city is also conspicuous.

In approaching from the northward or westward, the twin peaks (the eastern sharp and the western rounded) to the southeastward of La Guaira form a good landmark, and will lead to a point from which the cathedral can be picked up.

The citadel, which rises to a height of 359 feet (109.4 m.) and surmounted by a flagstaff 50 feet (15.2 m.) high is situated immediately behind the town.

**La Guaira Light**, flashing white, with red sector, 41 feet (12.5 m.) above high water, visible 11 miles, is exhibited from a 27-foot (8.2 m.) steel framework structure, the lower part square and upper part conical, on the western extremity of the breakwater. (See Light List.)

**Wreck.**—A sunken wreck, covered by 26 feet (7.9 m.) of water and marked by a barrel buoy, is situated about 420 yards  $225^\circ$  from the breakwater light.

**Shoal.**—A shoal with depths of  $2\frac{3}{4}$  fathoms (5.0 m.) at its other edge, extends 50 yards westward from the end of the breakwater.

**Buoy.**—The outer edge of this shoal is marked by a red buoy.

**Mooring buoys.**—Besides the red buoy marking the shoal off the end of the breakwater and the above-mentioned wreck buoy there are several mooring buoys in the harbor.

**Outer anchorage.**—The anchorage off La Guaira northward of the breakwater is an open road, exposed from the eastward through north to the westward, and is generally considered safe except in winter, the season of rollers, but it should be only used as a temporary anchorage now the harbor works are completed. There is good holding ground in 7 to 10 fathoms (12.8 to 18.3 m.) but it is rocky in places. The sea breeze generally fails about 7 p. m., when a calm succeeds, and sometimes a breeze sets in from the westward, which renders it necessary to lay out a kedge in that direction ready to swing to. Men-of-war may moor to the buoys inside the breakwater, but must leave a clear passageway between the buoys and the breakwater.

**Breakwater.**—There is no natural harbor at La Guaira, but a breakwater, 21 feet (6.4 m.) above the sea level and about 680 yards in length, has been constructed in a westerly direction from Punta Santa Barbara, the northwestern extremity of the town, forming the port and sheltering the wharves.

**Inner basin.**—On the eastern shore of the harbor some 18 acres of land has been reclaimed by the construction of a concrete quay with two jetties. This is fronted by the eastern mole, forming an inner basin 2 acres in extent, with depths of from 7 to 12 feet (2.1 to 3.7 m.).

Southward of this is a retaining sea wall, known as East Quay, affording ample berthage for small craft.

There are ample facilities for handling and storing freight.

**Seasons.**—The rainy season at La Guaira is from June to January; slight showers also occur during the summer months. Thunderstorms are neither frequent nor severe; they usually occur from 4 to 9 p. m.

Inland the seasons are reversed—the dry season is from October to March, during which time there is but little rain. The rainy season commences in April and ends in October, in which period the rains are abundant.

**Temperature.**—From the beginning of December until April are the cold months, the day temperature seldom much exceeding 80°, while during the hot months it ranges from 84° to 90°.

**Rainfall.**—The rainfall at La Guaira is very variable, but as a rule it is small, not exceeding 10 inches in a dry year, but it may amount to 40 inches. On the mountains above rain is of course more plentiful.

**Winds.**—La Guaira is southward of the hurricane zone, although at no great distance from it. The prevailing winds are the north-east trades, which blow with great regularity from February to

June, but are often experienced also during other months of the year.

From July to October westerly winds and calms occur frequently.

Usually once or twice a year during the autumn months, calderetas or hot, sharp blasts from the mountain gorges may be looked for, strong enough to unroof houses and uproot trees. They are not usually of long duration, but are dangerous to vessels in the harbor not well secured.

During the night and early morning a slight land breeze blows down from the mountains, which reduces the temperature but is too light to affect the sea.

The effects of hurricanes, whose courses bring them unusually far southward, are occasionally strongly felt at La Guaira. At this season vessels should be prepared to get under way at short notice and to slip their stern moorings and ride with their anchors ahead, or if the anchorage is crowded, to put to sea.

**Heavy seas** of a different class are common in February and March, the result of ground swells combined with strong northeast winds, and form heavy breaking seas. A column of spray 120 feet (36.6 m.) in height has been seen to rise above the breakwater. Heavy ground swells in La Guaira of a dangerous character are nearly always preceded by calms or irregular winds; the blowing of the regular trade wind is a certain mark of safe weather.

**Rollers.**—Heavy and dangerous seas are experienced chiefly from October to March and are the after effects of strong gales in the Atlantic and Caribbean Sea. They take the form of heavy ground swells, and in the most severe cases of long rollers usually coming in groups of three or four at intervals, and having enormous force and destructive power; fortunately they are not of frequent occurrence. These rollers at times begin to show in depths of 7 fathoms (12.8 m.) and in long lines of about 2 miles in length, gradually rising as they approach the shore.

**Signal station.**—There is a signal station on Fort Vigia, which communicates the nationality of incoming vessels to harbor authorities.

**Tides.**—The high-water interval at La Guaira is 6h. 00m.; mean range of tides 2.3 feet (0.7 m.); spring range 2.8 feet (0.9 m.).

**Current.**—The equatorial current flows from east to west in the offing; near the shore it is naturally weak, seldom exceeding  $\frac{1}{2}$  knot. During the prevalence of calms and irregular winds, especially during the autumn months, a counter inshore current is frequently observed, at times amounting to  $2\frac{1}{2}$  knots, and has considerable scouring power on the sea bottom near the shore.



**Pilots.**—Pilotage is not compulsory, but if desired pilots will board outside of breakwater.

The signal for a pilot is three blasts on the whistle.

**Directions.**—Sailing vessels should make the coast eastward of La Guaira on account of the prevailing westerly current; the mountains afford ready means of identification when not obscured by mist. On a nearer approach the cathedral tower (white) is the most prominent object. As there are no dangers in the approach, it is only necessary to round the breakwater at a prudent distance and anchor in a sufficient depth of water. Berthing is done under the harbor authorities.

Steamers steer south by east, passing westward of small buoy off the end of the breakwater, anchor west by south from end of breakwater, until visited by quarantine officer. Then pass between end of breakwater but to south and westward of the red buoy and mooring buoy directly south, taking pier or buoys as directed by harbor authorities. Ships moor bow and stern when mooring to buoys. That part of the harbor lying to the south of the line of buoys is generally full of small craft.

**Regulations.**—The harbor is closed between 6 p. m. and 6 a. m. The custom authorities make visits between 7 and 11 a. m. and 1 and 6 p. m. Rat guards must be placed on all mooring lines, including those to buoys, and on anchor chains. Vessels must move off from the piers at night.

**LA GUAIRA** ( $10^{\circ} 37' N.$ ,  $66^{\circ} 56' W.$ ; *H. O. Chart 1349*) is situated at the foot of the mountains, on a narrow and uneven plain, only from 180 to 250 yards wide in places, between two huge masses of rock. Its situation, below the mountains, renders it very hot, its mean temperature from careful observation being  $84\frac{1}{2}^{\circ}$ . Formerly the town was very dirty and unsightly but in recent years many civic improvements have taken place, such as installation of sewage and electric lighting systems; the paving of streets and the construction of modern buildings. The population of the town in 1926 was about 8,300.

The United States is represented by a vice consul.

**Wharves.**—Steamers visiting the port are moored at three jetties that project 36 feet from the southern side of the breakwater; the jetties are from 180 to 360 feet long, with depths of 31 to 33 feet (9.4 to 10.1 m.) alongside.

For these wharves or jetties there is a 12-ton stationary crane on the middle jetty, a 5-ton stationary crane on the inner jetty. In addition there are three 3-ton and one 5-ton movable cranes and one 15-ton locomotive crane. These jetties have covered sheds and railway tracks run down them.

On the eastern side of the inner harbor there is a quay or mole for the use of the coastwise traffic, with depths of from 12 to 15 feet (3.7 to 4.6 m.) alongside. There are lighters of from 40 to 50 tons capacity for use in unloading vessels in the stream.

**Tug.**—There is a large seagoing tug at La Guaira.

**Supplies.**—Commissary provisions are plentiful. Meats, fish, and tropical fruits can be obtained with special advantages. Engineering and ship chandler supplies can be obtained in limited quantities.

Water may be obtained from pipe lines laid on the jetties. By application to the La Guaira Harbor Board water will be delivered alongside vessels lying at anchor in either the inner or outer harbor.

**Coal.**—No coal is stored here for bunkering purposes, but the railroad and the Harbor Corporation maintain a small stock for their own use. In cases of emergency, a small quantity could undoubtedly be obtained.

**Fuel oil.**—This is not a bunkering port, but fuel oil can be obtained in sufficient quantity to get the vessel to the fueling station in Curacao. Oil would be delivered from a 6-inch pipe line at the Aduana Dock, which has 14 feet (4.3 m.) alongside.

**Repairs.**—There is a marine railway that takes vessels not over 100 feet long and of not over 8 feet (2.4 m.) draft. Charges are according to agreement. The Harbor Corporation, a British concern, has a machine shop with skilled machinists where small engine parts may be made. No iron castings are made at La Guaira but they can be obtained from Caracas. Brass castings up to 200 pounds are made locally. There is an inner basin where small vessels can be careened and coppered or calked.

**Radio.**—The station is Government-owned and handles commercial messages. Call letters, A Y G. (See International Radio List.)

**Communication.**—La Guaira is connected by rail with Caracas and by telegraph with Puerto Cabello, Carenero, and the general telegraph system. The cable from Curacao is landed on the northern side of the town near the Trinchera Bastion. Steamers of several lines call at La Guaira frequently.

**Time.**—La Guaira keeps the time of Venezuela, which is that of the meridian  $67^{\circ} 30' W.$ , or 4h. 30m., slow on Greenwich civil time. There is no time signal.

The sanitary condition of the port is fair.

**Hospitals.**—There are two hospitals, one of 40 and the other of 33 beds.

**Quarantine regulations.**—All merchant vessels must remain outside the breakwater until visited by the health authorities.

**CARACAS** ( $10^{\circ} 31' N.$ ,  $66^{\circ} 55' W.$ ), the capital of Venezuela, and the seat of government, is situated at the western end of the Llano de Chacao, 3,500 feet (1,066.8 m.) above the level of the sea; it is 7 miles from the coast in a direct line, but the carriage road to it is 21 miles in length, the railway 23 miles, and the bridle road over the mountains 12 miles. It combines within itself nearly all the advantages of a great city. The houses are mostly but one story high, and of modest appearance, and adapted to the conditions of the climate, which is semitropical in nature. The shops contain an abundant supply of imported goods. There is a good supply of water brought by aqueduct from the Rio Macarao, and the markets are well stocked.

The United States is represented by an envoy extraordinary and minister plenipotentiary.

In 1926 the population of Caracas was 135,250.

**Communication.**—Caracas is connected by railway with Guarenas and Sta. Lucia to the eastward, and with Puerto Cabello via Victoria and Valencia, to the westward, and by telegraph with all parts.

The Central Railroad, running inland from Caracas, is in course of extension to Ocumare and Cua.

Carriage roads connect with the railroads and penetrate farther into the interior. In the remote districts traffic is carried on by pack animals. A telephonic service has been established.

**COAST** (*H. O. Chart 2319*).—The coast from La Guaira trends westward for 6 miles to Trinchera Point, and thence southwestward 4 miles to Arrecifes Point, when it resumes a westerly direction for 45 miles to Puerto Turiamo.

From Trinchera Point to  $2\frac{1}{2}$  miles westward of Punta de Arrecifes, the shore is foul, but from thence to Puerto Turiamo it may be coasted within 1 mile.

**Mountains.**—From La Guaira to Puerto Cabello a narrow ridge of mountains lies parallel with the shore at a distance of from 6 to 8 miles inland. Monte Palmar, 19 miles southwestward from La Guaira, is 6,373 feet (1,942.5 m.) high; and Tamaya, southward of Puerto de la Cruz, is elevated 3,973 feet (1,211.0 m.).

**Cape Blanco** is a small conical sand hill, partly covered with brushwood, easily recognized from a distance, and forming a good mark of recognition for vessels approaching La Guaira from the westward. The shore about Cape Blanco, which is a short distance eastward of Point Trinchera, has a gray and rugged appearance, and at about 4 miles off looks like a town standing under the high land.

**Puerto de la Cruz** ( $10^{\circ} 33' N.$ ,  $67^{\circ} 21' W.$ ), 22 miles westward of Cape Blanco, is a small cove about 300 yards wide and 400 yards long; the shore all round is so steep that at a short distance from it there are depths of  $4\frac{1}{2}$  fathoms (8.2 m.). A rock lies close to its eastern entrance point, and a small stream discharges into the head of the cove.

**The anchorage** is good, but being so confined it is only fit for small vessels.

**Morro Choroni** is a small projecting headland about 15 miles westward of Puerto de la Cruz, and 1 mile beyond the Morro is Aroa Point.

**Cata Bay**, situated 8 miles westward of Morro Choroni, is  $\frac{1}{2}$  mile in extent in length and breadth, with an islet close off its eastern point.

A stream discharges at its head, fronted by a shallow bank, extending about 200 yards from the shore. Elsewhere the bay is free from danger, with depths ranging from 25 fathoms (45.7 m.) in the middle to  $4\frac{1}{2}$  fathoms (8.2 m.) at about 300 yards from the beach.

On the eastern side of the bay there is a vigia or lookout, and it is further recognized by Monte de la Mesa, a remarkable table mountain, 7,343 feet (2,238.1 m.) high, situated about 8 miles southeastward of it, and 6 miles inland; and also by the Cerro de Ocumare, 700 feet (213.4 m.) high, situated 5 miles southward of the bay.

**Supplies.**—Water and wood may be obtained in Cata Bay and stock and vegetables from a small town about 4 miles distant.

**Ocumare Bay.**—About 1 mile westward of Cata Bay is the eastern entrance point of Ocumare Bay, in which there is good but confined anchorage, for it has many banks in it and becomes narrow to the southward. An islet lies about 100 yards northwestward of its eastern point, with a least depth of 6 fathoms (11.0 m.) between.

A river discharges into the bay to the southward of this islet, having on its banks a few fishermen's huts; at a short distance inland is the commercial town of Ocumare.

**Wharf.**—There is a wharf at Ocumare, which is 492 feet long and 33 feet wide; equipped with a small track, and an open shed at its end.

**Directions.**—In taking up an anchorage in this bay a vessel must haul in close around the western side of the islet, and be prepared to anchor quickly in 6 or  $6\frac{1}{2}$  fathoms (11.0 or 11.9 m.) over sand, and 200 yards or a little more to the southward of it, for by shooting farther in there is danger of grounding.

**Ocumare Marsh** is an opening, the eastern point of entrance of which is 2 miles westward of the islet in Ocumare Bay; the western point, off which is an islet, is formed by an isolated hill that rises on the lowland. The opening is skirted by a broken reef, through which there is a channel having depths of from 4 to 12 fathoms (7.3 to 21.9 m.) leading into an anchorage; it is very indifferent, however, and only fit for small coasters.

**Port Turiamo** ( $10^{\circ} 28' N.$ ,  $67^{\circ} 51' W.$ ; *H. O. Chart 988*) lies  $1\frac{1}{2}$  miles westward of the Morro de Cienaga. It is  $1\frac{1}{4}$  miles wide at the entrance, between Port Turiamo and Punta del Oeste, decreasing inward to about 1,500 yards, and is about 2 miles in length from north to south. Its shores are fringed with a coral ledge to the distance of about 60 yards.

Turiamo Islet, high, bold, and steep-to, lies about 200 yards off Turiamo Point.

The Turiamo River forces its way through the sandy beach at the head of the bay.

**Anchorage.**—Excellent anchorage in depths of 20 fathoms (36.6 m.) and under, sand and mud, and is available for vessels of any draft. Another anchorage is shown on the chart at the southeastern angle of the bay in about 11 fathoms (20.1 m.).

**Harbor developments.**—The Government of Venezuela in 1928 passed an act declaring Port Turiamo to be a free port. It is the hope of the Government to make this place a large oil-shipping port. No plan of harbor construction or improvements have as yet been promulgated.

**Coast** (*H. O. Chart 2319*).—From Port Turiamo the shore trends westward and northwestward for about 9 miles to Brava Point, at the entrance of Puerto Cabello. With the exception of Labadera Rock, situated close to the shore  $2\frac{1}{2}$  miles westward of Port Turiamo, it is free from danger until the cays described below are reached.

**Outlying cays** (*H. O. Chart 991*).—The undermentioned cays are all wooded and fringed by coral reefs extending from 100 to 200 yards, with from 4 to 9 fathoms (7.3 to 16.5 m.) close-to. With the exception of the shoal southward of Long Island, the channels between them are said to be free of danger.

**Long (Larga) Island** ( $10^{\circ} 30' N.$ ,  $67^{\circ} 57' W.$ ).—Abreast the bight where the shore alters its direction to the northwestward is

**Larga or Long Island**, about 1 mile in extent, and the same distance from the shore. It may be seen at times from a distance of 18 or 20 miles.

**Shoals.**—About 250 yards southward from the southwestern extremity of Larga Island is a shoal 300 yards in length, north and south, and 200 yards in width. It breaks on the northern side, and has a depth of  $\frac{3}{4}$  fathoms (5.0 m.) on the southern portion.

The channel between the island and the shoal carries a depth of 9 to 10 fathoms (16.5 to 18.3 m.) and between the shoal and the shore, 10 to 11 fathoms (18.3 to 20.1 m.).

**Santo Domingo (Middle) Islet** is situated 900 yards westward of Larga Island, with depths of 7 to 10 fathoms (12.8 to 18.3 m.) between. It is 500 yards in extent, with a lake in its northwestern portion.

**Alcatraz Islet** lies 1,300 yards northwestward from Santo Domingo, with depths of from 11 to 18 fathoms (20.1 to 32.9 m.) between. It is nearly 700 yards in extent, and a great portion of it is taken up by a lagoon, having its entrance, apparently closed by reefs and islets, to the northwestward.

The reef surrounding the islet is reported to extend farther to the westward than is shown on the present plan.

**Ratones Islet** lies 300 yards offshore and 1,400 yards southwestward from Santo Domingo, the channel between carrying about 10 fathoms (18.3 m.).

**King Island** lies 550 yards offshore, with 11 to 13 fathoms (20.1 to 23.8 m.) between and 2,100 yards southwestward from Alcatraz Islet; though not sounded out the depths between appear to be 13 to 16 fathoms (23.8 to 29.3 m.).

**Anchorage—Wood and water.**—Between Larga Island and the mainland there is good anchorage in 10 to 12 fathoms (18.3 to 21.9 m.) over sand and ooze, with the southwestern point of the island bearing  $339^{\circ}$ , about 1,200 yards, avoiding the shoal above mentioned; this is a convenient anchorage for obtaining wood.

Water may be procured from Rio Borburata, but as the mouth of the stream shifts, the best way will be to anchor the boats off it, steadying them with a line to the shore, and fill the casks in them from baricoes carried on oars, the sand being too soft for the erection of shears. A good position from which to water is in 10 or 11 fathoms (18.3 or 20.1 m.) at about  $\frac{1}{2}$  mile north-northeastward of the river, midway between it and the southwestern extremity of Larga Island.

**Borburata Harbor** ( $10^{\circ} 30' N.$ ,  $68^{\circ} 00' W.$ ) is about  $1\frac{1}{2}$  miles eastward of Brava Point, the northwestern extremity of the reefs off Puerto Cabello; it is a small, snug inlet, 300 yards wide by about

600 yards in length; its sides are skirted by a coral ledge, leaving a channel between about 200 yards in width. The depths are from 6 to 9 fathoms (11.0 to 16.5 m.), 6 fathoms (11.0 m.) being found almost alongside the beach at the head of the bay.

As it lies northwest and southeast, it has the advantage of allowing a sailing vessel to sail in and out with the usual trade wind; and, being to windward of the swamps at Puerto Cabello, is a more healthful temporary anchorage for a handy vessel than off the city.

**PUERTO CABELLO** ( $10^{\circ} 30' N.$ ,  $68^{\circ} 01' W.$ ; *H. O. Chart 991*) may be described as a lagoon about 1 miles in length and the same in breadth, bounded on the north and west by a line of narrow, low, sandy islands and reefs; the interior to the east and south being nearly filled with swampy mangrove cays, between which are several channels of deep water.

**Depths.**—The depths in the entrance channel is from 3 to 8 fathoms (5.5 to 14.6 m.). In Great Bay, there is a small area 800 yards long, northeast and southwest by 200 yards wide, with depths of from 5 to 6 fathoms (9.1 to 11.0 m.).

Bay of Sta. Lucia and New Harbor Bay have, respectively, about  $2\frac{3}{4}$  and 3 to 4 fathoms (5.0 and 5.5 to 7.3 m.), but the deepest water in the entrance cut to these basins is  $2\frac{3}{4}$  fathoms (5.0 m.).

In the outer harbor, the depths are from 8 to 12 fathoms (14.6 to 21.9 m.).

**Landmark.**—On a hill 540 feet (164.6 m.) high, to the westward of the town, there is Fort Solano built of white stone, which may be seen from a distance of 20 miles.

**Conspicuous objects.**—There are two brick chimneys on the southern shore of the outer anchorage.

**Guaiguaza Islet**,  $\frac{1}{4}$  mile in length, is located  $1\frac{3}{4}$  miles westward from Brava Point Light and  $\frac{1}{4}$  mile from the shore. There is a clear channel 300 yards in width between the islet and the mainland having depths of from 8 to 9 fathoms (14.6 to 16.5 m.).

**Larne Shoal** is a dangerous patch of coral, approximately 250 yards in diameter with a depth of 3 fathoms (5.5 m.), with 7 fathoms (12.8 m.) close alongside, lying about 300 yards northward of the northern point of Guaiguaza Islet. During strong breezes, this shoal usually breaks.

Shoal water extends 150 yards north and south of the islet.

**Brava Point Light**, fixed and group flashing white, 91 feet (27.7 m.) above high water and visible 15 miles, is exhibited from a green tripod upon a quadrangular tower, 82 feet (25.0 m.) high, on Brava Point.

From a distance the framework supporting the light can not be distinguished, it appears only as a house with a square tower. A tall framework structure of iron also stands on the northern side of the entrance.

**Caution** should be observed in approaching this light, for, if not careful, a vessel may run in beyond the harbor entrance, and would be on the rocky beach without further warning.

**The entrance** to Great Bay lies on the western side of the lagoon, forming a channel about 1,000 yards in length, but less than 100 yards wide.

On the northern side of the entrance stands Fort Libertador, formerly St. Philips Castle, and the navy yard, while on the southern side is the pier and the customhouse.

**Lights.**—A fixed red light, 91 feet (27.7 m.) above high water, is exhibited from a steel structure, on a concrete base, on the southern bastion of Fort Libertador, at the northern side of the entrance to the harbor.

A fixed green light is located on the southern side of the harbor near the customhouse.

**Anchorage.**—The bay westward of the town, between Brava Point and Larne Shoal, is free from danger, and good anchorage may be taken up as most convenient in 10 to 12 fathoms (18.3 to 21.9 m.), sand and muddy bottom. Vessels also moor head and stern in all parts of the entrance channel.

Good anchorage may be had with Fort Solano and the western smokestack in range with the southern bastion of Fort Libertador bearing 90°.

**Prohibited anchorage.**—A water pipe has been laid across the entrance to Puerto Cabello from the town quay to Fort Libertador and the positions where it lands are marked by notice boards with the words "Tubo de agua. No fondear. No anchorage" on them. Vessels are prohibited from anchoring on the line between the notice boards.

**Buoys.**—There are two mooring buoys in the channel of this port for the use of naval vessels.

**Great Bay** is not now used as an anchorage, owing chiefly to its having no wharves or facilities for communicating with the town and also from its unhealthfulness. The southeastern and southwestern basins are named, respectively, Bay of Sta. Lucia and New Harbor Bay.

**Pilots.**—Pilotage is not compulsory, but is considered advisable if not familiar with the harbor. The signal for a pilot is the customary international signal.

**Directions.**—Fort Solano, to the westward of the town, bearing  $183^{\circ}$ , leads to the anchorage.

The western smokestack in range with Fort Vigia bearing almost  $180^{\circ}$  is a good range for entering.

With the exception of the Larne Shoal and the reef extending about 200 yards off Brava Point, and for about half that distance off Fort Libertador, there are no dangers in the approach to Puerto Cabello. Sailing vessels should make the land a little to windward, on account of the prevailing westerly current.

**Harbor regulations.**—Vessels are not allowed to enter the harbor until visited by the port authorities. There is a penalty of a heavy fine for violating this regulation. No boats are allowed to enter or leave the harbor after dark.

**PUERTO CABELLO** ( $10^{\circ} 29' N.$ ,  $68^{\circ} 01' W.$ ; *H. O. Chart 991*) is the port of entry of the State of Carabobo. It is situated on the southern side of the entrance and about 20 miles northward from Valencia, the capital, which had a population of about 26,800 in 1926, and to which it is connected by a railway.

The town affords the convenience to vessels of being able to lie alongside the wharf in security in 26 feet (7.9 m.) of water. It is to be observed, however, that lying so low and immediately to leeward of swamps it is exceedingly unhealthful and therefore by no means so desirable a place as La Guaira or Sta. Ana at Caracao.

The United States is represented by a consul and a vice consul.

The estimated population is about 20,000.

**Wharf.**—The wharf at Puerto Cabello has fully 1,800 feet frontage, with an average depth along its entire front, of 26 feet (7.9 m.). The customhouses, offices, sheds, etc., and the lines of the steam and tram railways adjoin the wharf. The wharf has no facilities for handling cargo and all loading or unloading must be done with ship's equipment.

There are a few government-owned lighters of 18 tons capacity for the use of vessels not at the wharf.

**Docks.**—There are two floating dry docks at Puerto Cabello, both owned by the Venezuelan Government; one constructed of steel in three sections and the other of wood. The steel dock is 282 feet long over all, 90 feet in breadth, has 22 feet (6.7 m.) over the sill at high water ordinary spring tides, and has a lifting power of 2,400 tons. The wooden dock is 180 feet long over all, 60 feet in breadth, has 19 feet (5.8 m.) of water over the sill at high water ordinary spring tides, and has a lifting power of 1,200 tons. (See Appendix II.)

**Repairs.**—There are well-equipped workshops and foundries in connection with the docks. These shops are supplied with one 2-ton movable crane and one 60-ton stationary crane.

**Supplies.**—Ship chandler and engineering supplies can be obtained in small quantities. Commissary provisions, with the exception of flour, sugar, and coffee, which can be obtained in any quantities, are scarce.

**Water.**—Fresh water is obtainable but the supply is not abundant. It is pumped aboard at any point alongside the wharf. There are no provisions for delivering water when anchored in the stream.

Water can also be obtained at the entrance of St. Stephen River or San Estavan, a little to the westward of the town, but a supply should be obtained early in the morning before the bathers and washerwomen take possession of the stream.

**Coal.**—There is no coal kept in stock for disposal.

**Fuel oil.**—About 1,600 tons of Venezuelan fuel oil is generally kept on hand. If the draft of the vessel permits, ship goes alongside a dock where the draft is 16 feet (4.9 m.) and fuel oil is delivered through pipe line. For vessels which can not go alongside, fuel oil is delivered in 18-ton oil barges. Diesel oil is available, but not in bulk.

**Communication.**—Puerto Cabello is connected by railroad with Caracas and Valencia. There is telegraphic connection with La Guaira.



**Radio station.**—A Government-owned radio station, call letters HRK, handles commercial messages. Normal sending radius is 150 miles. (See International Radio List.)

**Climate.**—The heat is somewhat tempered by the sea breeze, which is regular; the mean temperature for the year is 84° F.

Rainfall is light from October to May and moderate the remainder of the year.

The sanitary condition of the city is only fair. The prevailing diseases are malaria, tuberculosis and venereal and intestinal diseases.

**Hospitals.**—There are three hospitals in the city, but none are recommended for seamen.

**Quarantine.**—Vessels have to wait outside the harbor for the visit of the customs officers.

**Mapleton Bank** (10° 40' N., 68° 01' W.; *H. O. Chart 964*), of 8 fathoms (14.6 m.), is said to lie 10 miles northward of Brava Point Light. This bank is said to be of doubtful existence, but the fishermen of the neighborhood assert that it exists.

**TRISTE GULF.**—From Puerto Cabello the coast curves around to the westward and northward for about 28 miles to Tucacas, forming the Triste Gulf; it is everywhere low and sandy and backed by mangroves; the land in the interior, although high, is less elevated than it is to the eastward, and a few miles to the westward of Puerto Cabello slopes gradually to the sea.

**Winds.**—The winds that prevail in Triste Gulf are alternate sea and land breezes, the former setting in from the northward and veering to southeast, the latter blowing from south to west-southwest. The times of these changes vary daily and can not be depended upon; generally the sea breeze commences at 10 a. m. and lasts till sunset, when the wind falls, sometimes to a calm, the land wind coming off about 10 p. m. and continuing till 8 a. m.; it frequently happens, however, that the sea breeze blows all night.

**Current.**—The current when setting to the westward in the offing, which is usually the case, is by the formation of Triste Gulf, forced out to the northward between the cays and the mainland; therefore, if from the strength of the sea breeze, or other causes, it is suspected to be running strongly in that direction, it will be better for a vessel bound to Puerto Cabello, or to windward, to work up to Cayo del Norte before stretching across.

**Isleta de Chaves.**—As far as the Aroa River, with the exception of the Isleta de Chaves, 12 miles westward of Puerto Cabello, the coast is clean, but, as a heavy swell rolls in, and the surf breaks violently on the beach, it will be better not to navigate it within 1½ miles, or in a less depth than 15 fathoms (27.4 m.).

**Yazacui River.**—The entrance to this river is about 17 miles west-northwestward of Puerto Cabello.

**Aroa River.**—About 5 miles north-northwestward from the Yazacui, is the entrance of Aroa River, where there is a village of about

200 huts; it has become of importance from its being the means of transporting the products of the copper mines lying about 60 miles in the interior, the ore of which, being brought to the banks, according to the state of the river, is conveyed to the mouth in iron canoes drawing about 14 inches (0.4 m.) of water, and taken thence in coasters to the depot at Tucacas for more convenient shipment.

From the Aroa River the coast trends more northerly to Tusacas, 6 miles distant, and here the sandy beach terminates.

**Outlying islets.**—Fronting the northern part of the Triste Gulf are three low mangrove cays, with swamps in their centers; the cays and attached reefs occupy a space about 4 miles in length.

**Cayo del Sur (South Cay)**, about 400 yards in length, lies 4 miles northeastward from the entrance of the Aroa River. From its southwestern extremity a reef, in many places dry, extends  $\frac{1}{4}$  mile, and is steep-to; there are depths of 7 fathoms (12.8 m.) at 100 yards, and 10 fathoms (18.3 m.) at 200 yards from the southwestern end, and on the southeastern side there is 6 fathoms (11.0 m.) close-to. From the northeastern extremity of the cay a coral ledge, with depths of 2 to 3 fathoms (3.7 to 5.5 m.), extends out  $\frac{1}{4}$  mile. The northwestern side forms a sandy beach, skirted by rocks, which makes landing difficult; but there are depths of 7 fathoms (12.8 m.) at the distance of 100 yards from the cay.

The channel between Cayo del Sur and the mainland is free from danger, and has a depth of 10 to 15 fathoms (18.3 to 27.4 m.) in mid-channel.

**Cayo del Medio (Middle Cay)** is about 800 yards in length and lies about 1,500 yards northeastward from South Cay. It is steep-to on all sides but the northeastern, from whence a reef projects  $\frac{1}{4}$  mile, where it terminates in 4 fathoms (7.3 m.). In the center of the channel, between this Cay and South Cay, there is a bank of 3 fathoms (5.5 m.) about 400 yards in extent, leaving a passage on both sides of it 200 yards wide, with a depth of 12 fathoms (21.9 m.).

In passing through, it will be safer to pass northward of this bank, and within 100 yards or less from Cayo del Medio, for there is a depth of 7 fathoms (12.8 m.) within a short distance of the latter; risk will be incurred by taking the South Cay side.

**Cayo del Norte (North Cay)**, lying  $2\frac{1}{2}$  miles northeastward from Middle Cay, is about  $\frac{1}{2}$  mile in length and steep-to on all sides but the northeastern, from whence a ledge, with depths of 2 to 3 fathoms (3.7 to 5.5 m.) extends  $\frac{1}{2}$  mile, with 7 fathoms (12.8 m.) at  $\frac{1}{4}$  mile beyond.

The channel between Cayo del Norte and Cayo del Medio is apparently clear, with the exception of the ledge off the northeastern

end of the latter; and it is by far the best to navigate either from the eastward or westward.

**Bank.**—About 2 miles northward of Cayo del Norte there is a coral bank of 6 fathoms (11.0 m.) with 24 fathoms (43.9 m.) close-to; it appears to trend toward Punta Tucacas, and is reported to be of considerable extent.

**Anchorage.**—The depths between these cays and the mainland, from Aroa River to Tucacas, are very regular, decreasing from 16 to 3 fathoms (29.3 to 5.5 m.) within 1,500 yards of the beach, this space affording good anchorage anywhere; the best shelter will of course be under the western side of the cays, leaving room, however, to veer or weigh with the land breeze, which sometimes blows freshly.

**TUCACAS** ( $10^{\circ} 48' N.$ ,  $68^{\circ} 91' W.$ ; *plan on H. O. Chart 2034*) lies in the northwestern part of Triste Gulf and on the west point of entrance of an extensive lagoon.

**Brava Island.**—The coast for the space of about 6 miles to the eastward of Tucacas, as far as Punta Tucacas, is fringed with wooded cays, their outer sides being skirted by low coral points and shallow ledges, leaving small channels leading into extensive lagoons navigable for boats. The southernmost and largest of these cays is named Brava Island, and the southeastern extremity of it Point Brava.

A coral reef extends to the eastward from Point Brava 400 yards, and near the extremity are some rocks above water, with depths of 6 fathoms (11.0 m.) within 100 yards of them. To the westward of the point a ledge extends westward about 100 yards.

**Brava Cove** is a snug sandy cove about 1,500 yards eastward of Tucacas and on the western side of Point Brava. There is the remains of an ore house and wharf at the northern point of the cove, with a depth of 16 feet (4.9 m.) alongside; the large white house still forms a good landmark and is visible from outside the cays.

**Shoals.**—A mud flat extends south-southeastward about 400 yards from the wharf on the eastern side of the town, and between it and the cays to the eastward there is a narrow channel, which permits vessels drawing 9 feet (2.7 m.) to get as high as the town, but it requires a pilot.

From the northern point of the cove a reef extends along the southern side of Brava Island, having 1 fathom (1.8 m.) on its outer edge at 100 yards from the shore; there is also a detached coral shoal of  $1\frac{1}{2}$  fathoms (2.7 m.) of water, 200 yards in extent, nearly 200 yards southward of this reef, and a patch of 1 fathom (1.8 m.) westward of it.

The depths southward of these shoals were reported in 1895 to be less than those on the chart, a depth of  $4\frac{1}{2}$  fathoms (8.2 m.) being

found 750 yards southwestward of Point Brava; caution, therefore, must be used when approaching this part of the coast.

**Buoys.**—A red buoy marks the end of the spit off the southwestern side of Mangrove Island. The channel is further marked by spar buoys and stakes.

**Anchorage.**—Good anchorage, in 7 fathoms (12.8 m.) of water, may be obtained about  $1\frac{1}{2}$  miles from the shore, with Point Brava bearing  $18^\circ$ . There is a good outer anchorage 600 to 800 yards southward of Brava Cove; but a vessel can go farther in and anchor with Point Brava bearing  $50^\circ$ , the tower on building at Brava Cove  $22^\circ$ , and the western point of Mangrove Island  $317^\circ$ . In good weather anchorage may also be taken in 3 to  $3\frac{1}{2}$  fathoms (5.5 to 6.4 m.) with Brava Point bearing  $255^\circ$  distant about 1,300 yards.

**Landing.**—The best landing place is on the northern side of the town.

**Tides.**—The tide rises about 3 feet (0.9 m.) in Brava Cove, but the time of high water is uncertain.

**Pilots** for Tucacas may be obtained at Puerto Cabello.

**Directions for Tucacas and Triste Gulf.**—Vessels approaching Triste Gulf from the eastward, or from Puerto Cabello, will observe from off the latter place in clear weather a remarkable gap in the eastern part of the mountain ridge, which commences to rise a short distance to the westward of Punta Tucacas; and on the southern side of the gap, on the face of the hill, will be seen some white cliffs.

As already stated, the widest and safest channel is between Cayo del Norte and Cayo del Medio, and the remarkable gap on about a  $306^\circ$  bearing will lead a vessel up to it. When within the cays bring the building in Brava Cove to bear a little on the starboard bow, taking care to pass Point Brava about  $\frac{1}{2}$  mile off. All that is necessary to observe is that the depth decrease suddenly when near Point Brava, and preparation must be made to bring up quickly, anchoring in the outer anchorage as before recommended; as stated, the water is reported to be shoaling.

When approaching from the northward, and being uncertain, if the cays seen are those off Chichirivichi, or those off the gulf, a course should be steered to keep 2 to 3 miles outside all of them, until the position is made out by means of the gap, when the preceding directions may be followed.

In leaving Tucacas, sailing vessels often have to work out, and in this case it will be better to move out on the previous afternoon and anchor for the night near the cays.

Puerto Cabello may sometimes be fetched from the southern channel, but it will generally be better to proceed out through the passage between Cayo del Norte and Cayo del Medio.

**Tucacas** ( $10^{\circ} 48' N.$ ,  $68^{\circ} 19' W.$ ) is a town of considerable size and at present is the shipping point for copper ore which is mined in this vicinity.

It is not an open port and vessels with Tucacas as destination must clear at Puerto Cabello.

**Loading and discharging** are effected by four lighters, two of 60 tons and two of 30 tons. The lighters always lie along the starboard side of the vessel.

There is a tug.

**Supplies.**—A small quantity of water for drinking purposes may be obtained, but it must be boiled.

In cases of emergency, a small quantity of coal can be obtained from the railway company.

**Communications.**—Tucacas is connected with the Quebrada copper mines by railway; also with La Luz, and thence by the Barquisimeto Line to Duaca, Barquisimeto.

**Punta Tucacas** (*H. O. Chart 964*) lies about 5 miles northeastward of Point Brava; no distinct point, however, appears, for between Brava Island and Chichirivichi the coast gradually curves around to the northeast and northwest for 8 miles. This projection is low and cut up by mangrove swamps for about 1 mile inland, when it commences to rise, and about 20 miles to the westward Mount Mission reaches the height of 2,358 feet (718.7 m.).

**Cayo Pescadores** ( $10^{\circ} 52' N.$ ,  $68^{\circ} 13' W.$ ).—The coast of Punta Tucacas is foul, and not far from it lie some cays, the southernmost of which are known as the Pescadores.

**Cayo Sombrero** is about 1 mile in length. Between it and the mainland there is a channel barely  $\frac{1}{2}$  mile wide, carrying 11 fathoms (20.1 m.) but it is dangerous from the reefs and shoals that skirt the mainland to leeward.

From abreast the northern end of Sombrero Cay to Chichirivichi, a distance of about 3 miles in a northwestern direction, the coast is still low, and bordered by a reef extending  $\frac{1}{2}$  mile offshore.

**Puerto Chichirivichi** ( $10^{\circ} 56' N.$ ,  $68^{\circ} 16' W.$ ; *H. O. Chart 148*) is a small, narrow, tortuous inlet, with low mangrove shores, about 2 miles in length, with depths of 24 to 42 feet (7.3 to 12.8 m.) in the outer part.

The entrance is obstructed by small cays, leaving a channel about 400 yards wide, with depths of 36 to 42 feet (11.0 to 12.8 m.) open to the northeastward, and therefore difficult for a sailing vessel to get out of, except with the land wind. A short distance within the entrance it opens out to  $\frac{1}{2}$  mile wide, and affords good anchorage over mud bottom.

**Caution.**—As this port has not been carefully surveyed beyond the line shown on the chart, shoals other than those shown may exist.

**Point Chichirivichi.**—The eastern side of the port is formed by a neck of swampy land about 2,300 yards in length, the northern part of which, named Point Chichirivichi is bordered by a reef to the

distance of about 800 yards to 1,000 yards, and on which there are several islets or rocks.

**Shoal.**—At 2.6 miles  $46^{\circ}$  from Point Chichirivichi there is a patch with  $3\frac{3}{4}$  fathoms (6.9 m.) of water.

**Cayo Sal**, so named from having a salt pond in the center, is situated 1 mile northward of Point Chichirivichi; it is about 1,500 yards in length, and skirted by a coral ledge which extends off nearly 200 yards, except on the southwestern side, where it is steep-to. Between it and Cayo de los Muertos there are depths of 6 to 9 fathoms (11.0 to 16.5 m.).

**Cayo Peraza**, the easternmost and smallest of the cays at the entrance of the port, is foul all around to the distance of about 200 yards on its northern and western sides, leaving a channel 200 yards wide between it and the reef off Point Chichirivichi, which is said to have a depth in it of 7 fathoms (12.8 m.).

**Cayo de los Muertos**, lying 600 yards westward of Peraza, is also fringed with a reef which extends nearly 400 yards from the northern point. The channel between it and Cayo Peraza is about 300 yards wide, and has 6 to 7 fathoms (11.0 to 12.8 m.) of water.

**Tides.**—The maximum rise of the tide is 2 feet (0.6 m.). The establishment of the port has not been determined.

**Borracho Cay** (*H. O. Chart 964*), the northern of these cays, and  $1\frac{1}{2}$  miles northward of Cayo Sal, is small, and has a reef extending  $\frac{1}{2}$  mile from its northeast and southern extremities.

The depth around these cays are regular, there being about  $6\frac{1}{2}$  fathoms (11.9 m.) about  $\frac{1}{2}$  mile from the coast, which depths continue to  $2\frac{1}{2}$  miles northward of Borracho, where there is 14 fathoms (25.6 m.) over sand and mud.

**Shoal.**—At a distance of 2 miles north-northeastward of Borracho Cay is a detached patch of 4 fathoms (7.3 m.).

**Coast—Tucuyo River.**—From Chichirivichi the coast trends northwestward for 16 miles to San Juan Point. About midway is the entrance of Tucuyo River; its course is said to be 330 miles, and it is navigable for canoes more than 150 miles.

The entrance may be recognized by a conspicuous white house on the northern bank.

**La Piragua** is a small shoal lying about  $5\frac{1}{2}$  miles northward of the Tucuyo,  $4\frac{1}{2}$  miles from Punta de San Juan, and about 1 mile off Punta Manatie, under the Cerrito del Manglar.

Elsewhere in this vicinity the depths are regular, and there is about 14 fathoms (25.6 m.) at 4 miles from the land.

**San Juan Bay** (*Plan on H. O. Chart 2034*), formed on the western side of Punta de San Juan, is about 2 miles in extent, sheltered

from between  $45^{\circ}$  and  $90^{\circ}$ , but it is so shallow that at 1,500 yards from the beach the depth is not more than  $3\frac{1}{4}$  fathoms (5.9 m.).

**San Juan Cay** ( $11^{\circ} 10' N.$ ,  $68^{\circ} 25' W.$ ).—A reef extends 400 yards from Punta de San Juan and at  $\frac{1}{2}$  mile from the point is San Juan Cay, fringed with a reef; the channel between the cay and the point is only fit for small craft.

**Northwest Cay (Cayo Noroeste)** lies  $2\frac{3}{4}$  miles northwestward from San Juan Point; it is about  $\frac{1}{2}$  mile long, and fringed with a reef, extending  $\frac{1}{4}$  mile off its northwestern and southeastern points, leaving a clear passage of over 1 mile in width between it and San Juan Cay, with a depth of  $4\frac{1}{4}$  fathoms (7.8 m.).

**Anchorage.**—The anchorage for small vessels in this bay is southwestward of San Juan Cay. If of large draft, a vessel should pass northward of Northwest Cay, at the distance of  $\frac{1}{2}$  mile or more, and would do well to anchor westward of that cay.

**Coast** (*H. O. Chart 964*).—The coast from San Juan Cay takes a northwesterly direction about 19 miles to Punta del Ubero, the whole space being free from danger and the depths regular, with the exception of a small rock named the Farallon del Soldado, about 8 miles from Punta de San Juan, lying close to a bold part of the shore. Abreast this rock, about 7 miles inland, the Cerro de Capadare rises to the height of 1,620 feet (493.8 m.).

**Ubero Bay**, formed on the western side of Punta del Ubero, is shallow, and scarcely affords shelter from the trade wind for large vessels.

**Washington Shoal.**—Northward 5 miles from Punta del Ubero is the northern part of a shoal having depths of from 3 to  $4\frac{3}{4}$  fathoms (5.5 to 8.7 m.). This shoal is about 4 miles long in a north-and-south direction and about 1 mile wide.

**Bordeaux Shoal** is a  $3\frac{1}{4}$ -fathom (5.9 m.) patch lying about  $6\frac{1}{2}$  miles northeastward from Punta del Ubero.

**Caution.**—As a steamer drawing 14 feet (4.3 m.) stirred up mud and sand, the depth being estimated at 20 feet (6.1 m.), in a position with Punta del Ubero bearing  $220^{\circ}$  distance 7 miles, and Punta Zamuro  $272^{\circ}$ , shallow water may be continuous from this position to the point, and all vessels should give this part of the coast a wide berth.

**Coast.**—The coast from Punta del Ubero to Punta Zamuro trends northward 12 miles, and from the latter, with a few slight curves of no importance, westward for 25 miles to Punta del Manzanillo. All this part is said to be free from danger, and may be navigated by proper attention to the lead to within the distance of  $1\frac{1}{2}$  miles.

**Mountains.**—In the interior, and also near the coast, are several mountains which may be seen from a long distance; and 6 miles inland southwestward from Punta del Manzanillo the Cerro de Cumarebo attains the height of 1,988 feet (605.9 m.).

**Cumarebo Bay.**—From Punta del Manzanillo the coast trends southwestward for about 6 miles, when it forms a small sandy beach known as Cumarebo Bay.

Vessels may lie close under the lee of the land at Cumarebo, but there is very little trade.

**Landmark.**—Southeastward, 3 miles from the above bay, on the side of the hill, is the small town of that name, with a conspicuous church, which may be seen for a great distance, and is a good landmark.

**Cumarebo Bank** ( $11^{\circ} 36' N.$ ,  $69^{\circ} 24' W.$ ).—At  $7\frac{3}{4}$  miles west-northwestward from Punta del Manzanillo, and  $6\frac{1}{2}$  miles from the sandy beach, lies a small rocky shoal, with a depth of  $5\frac{1}{2}$  fathoms (10.1 m.) and 11 to 18 fathoms (20.1 to 32.9 m.) close-to.

**Vela de Coro Bay**, on the western side of Frayles Point, has anchorage in 4 to 6 fathoms (7.3 to 11.0 m.), and may be entered by the lead, for there is no danger.

**Vela de Coro Light.**—A fixed white light, 33 feet (10.1 m.) above high water, visible 2 miles, is exhibited from a wooden structure 26 feet (7.9 m.) high, in Vela de Coro.

**Town.**—At the southeastern side of the bay stands Vela de Coro, consisting of a few stone houses, among which the customhouse on the beach is easily distinguished.

Coro River empties into the sea about  $1\frac{1}{2}$  miles to the westward of the town, and about 2 miles inland to the eastward of the town is an Indian village named Carrizal.

With only a moderate breeze there is considerable sea in Vela de Coro Bay.

**Isthmus of Medanos.**—From the Coro River the direction of the coast turns abruptly northwestward and forms a ridge of low sand hills about 19 miles in length and 2 to 3 miles in breadth, interrupted by some swamps and small lagoons, uniting Paraguana Peninsula to the mainland, and known as the Isthmus of Medanos.

**Peninsula de Paraguana—General remarks** (*H. O. Chart 5520*).—It is connected with the continent by the low, narrow Isthmus of Medanos; is 33 miles from north to south and 28 miles from east to west. The southeastern section is occupied by a rocky mountainous mass, of which the highest peak is Pan de Santa Ana, a rugged mountain that rises to a height of 2,800 feet (853.4 m.). The peak is frequently covered with clouds, but on a clear day it may be seen for a



distance of 60 miles. During the winter months, when the trade winds are strong, a haze usually prevents seeing the mountain at a distance of over 30 miles. From the Pan de Santa Ana an irregular ridge of hills continues to the northward, of which the only prominent peak is Arajo, a small, conical hill 8 miles north of Santa Ana. The Peninsula de Paraguana is, except for this ridge, a fairly flat plateau about 100 feet (30.5 m.) above sea level, with small trees and brush growing on it. The principal inland towns are Pueblo Nuevo, Adicora, and Rosario. The eastern shore of the peninsula is practically uninhabited. On the western shore the principal town is Los Taques or Estanques. There are fishing settlements at La Macolla, Amuay, Carirubana, and Punta Cardon. The natives are mostly of Indian blood with a mixture of Spanish; all of them speak and understand Spanish. Considerable trade is carried on between Peninsula de Paraguana and Maracaibo and Venezuelan ports to the eastward. The native products are guano, hides, fish, and divi-divi.

**Cape San Roman** ( $12^{\circ} 12' N.$ ,  $70^{\circ} 00' W.$ ).—The eastern coast of the peninsula from the isthmus trends 15 miles nearly north to Punta de Aricula, and thence sweeps round to the northwestward for about 20 miles to Cape San Roman, the northern extremity of the peninsula, which is high, bold, and faced with steep red cliffs on which the sea breaks heavily. The shore is foul to a short distance, but the soundings off it are deep and vessels of any draft can pass within a mile of Cape San Roman.

A rocky flat-topped hill lies just south of Cape San Roman and to the westward are sand dunes 40 feet (12.2 m.) high. In moderate weather a boat may land in the lee of Punta Baja Baroa,  $1\frac{1}{2}$  miles west of Cape San Roman.

**Cape San Roman Light**, flashing white, visible 10 miles, 30 feet (9.1 m.) above the water, is shown from Cape San Roman.

**Current.**—The current off the cape sets generally to the westward and attains at times a velocity of 3 knots.

**Northwest coast.**—From Cape San Roman to La Macolla the coast trends west southwestward for 13 miles. Numerous sand dunes border the shore, varied by low rocky cliffs with occasional rocky ledges extending a short distance offshore. There are sheltered boat landings at Punta Chaure 4 miles southwestward from Cape San Roman, distinguished by two sand dunes 20 feet (6.1 m.) high, and at Port Macamba in the lee of Punta Macamba, 3.4 miles to the eastward of Punta Macolla.

**Anchorage.**—Ships may anchor inside the 10-fathom (18.3 m.) curve and obtain some shelter from easterly breezes between Punta Baja Baroa and Port Macamba. Vessels should not go inside the 5-fathom (9.1 m.) curve, as the beach is very steep-to.

**Punta Infierno** is a high cliff covered with sand. (Not shown on chart.)

**Punta Macolla** is low, with sand dunes and a few mangrove trees. A white house with a cupola about  $\frac{2}{3}$  mile east of the point is very conspicuous from the southward and westward. A long line of breakers runs south of the point under ordinary conditions of wind and sea. Several rocky ledges extend off the point to a distance of 800 yards. Vessels should keep a mile off Point Macolla, as the water shoals very suddenly. Anchorage in the lee of the point may be found by approaching cautiously and anchoring in not less than 6 fathoms (11.0 m.). During the season of strong trades the swell sweeps round Punta Macolla and is fairly heavy, so that the anchorage is not always comfortable. Boats may land near the adobe house in the lee of the point.

**Punta Macolla Light** ( $12^{\circ} 06' N.$ ,  $70^{\circ} 13' W.$ ; *H. O. Chart 5520*), a flashing white light, 130 feet (39.6 m.) high, visible 17 miles, is shown from a steel framework bower on a concrete base 115 feet (35.1 m.) high. In 1928, this light was reported to be irregular in its characteristics.

**GULF OF VENEZUELA—General remarks.**—Between La Macolla and Point Espada the entrance to the gulf is 52 miles wide, and its length to the head of Calabozo Bay at its southwestern extremity is about 104 miles. San Carlos Island, at the entrance to Lake Maracaibo, is about 102 miles  $234^{\circ}$  from Point Macolia. The water in the gulf is generally discolored, due to the discharge from Lake Maracaibo and from the mud washed off the shoals along the Paraguana Peninsula and in the Gulf of Coro. Patches of yellow water having the appearance of shoals are seen at various points in the gulf, but no significance need be attached to them except close to shore.

**Weather.**—The trades blow with great force from northeast to east in the Gulf of Venezuela most of the year. During the winter months, from December until March, wind of force 5 to 7 may be expected almost continuously. Winds are strongest from 3 p. m. until 11 p. m., usually letting up slightly in the early morning. In the summer months there are occasional winds from west of north, and during the hurricane season in the Caribbean heavy swells may set in from the northward. Hurricanes rarely occur in the Gulf of Venezuela, only one having been recorded during the 37-year period 1887 to 1923. There is very little rain in this region, although thunderstorms and heavy showers pass along the south coast during the months of November, December, and January, and there are occasional heavy rains on the Paraguana Peninsula.

**Currents.**—A coastal current circulates about the gulf, setting to the southwest along the Guajira Peninsula and turning to the eastward along the south shore of the gulf. This current turns to the northward about Point Peñas and is dissipated in the center of the gulf; along the south shore its axis is just outside the 5 fathom (9.1 m.) curve, where it sometimes reaches a velocity of 1 knot, but the effect of it is not great during the strong northeast trades. The current along the eastern shore sets to the southwestward at from  $\frac{1}{2}$  to 1 knot. Off the entrance to Lake Maracaibo a tidal current of small velocity is experienced.

**Aids to navigation.**—There are no artificial aids to navigation maintained by the Venezuelan Government in the gulf. The Caribbean Oil Co. has put in a series or range marks, beacons, and buoys in the entrance to Lake Maracaibo, and the Venezuela Gulf Oil Co. keeps up two lights and a buoy at Piedras Bay.

**Water—Supplies.**—No water for boilers or for drinking can be obtained except at Maracaibo. The drinking water for the native population is surface water stored in artificial or natural pools and barely suffices for the present needs. Its use is not recommended except in emergencies. A few chickens and eggs may be obtained at the villages and fresh beef or goat meat may be purchased at Estanques and Carirubana if notice is given. During most of the year it is possible to buy fish in any desired quantity. No coal or fuel oil is available but crude oil is exported in great quantities.

**West coast of Peninsula de Paraguana.**—From La Macolla the coast trends about east by south for 12 miles to Punta Cucuy, with depths of 3 fathoms (5.5 m.) and less extending about 1 mile offshore.

**Anchorage.**—Vessels may anchor anywhere along the west shore of the peninsula and obtain shelter from the prevailing winds. The changes in depth are abrupt, so that ships should not have too much speed when approaching an anchorage.

**Shoals.**—Off Point Jacuque a shoal with 9 feet (2.7 m.) of water lies 1.2 miles offshore, bearing  $210^\circ$ , distant  $7\frac{1}{2}$  miles from Punta Macolla Light. There are occasional breakers on this shoal. The shoal off Punta Cucuy extends well offshore and the water hereabout is always discolored.

**Punta Salinas** ( $11^\circ 51' N.$ ,  $70^\circ 18' W.$ ; *H. O. Chart 5520*) lies 3 miles  $192^\circ$  from Punta Cucuy. Between these two points water with depths of less than 3 fathoms (5.5 m.) extends  $1\frac{1}{4}$  miles offshore and vessels should not approach closer than  $1\frac{1}{2}$  miles until Punta Salinas bears  $135^\circ$ . There are three conspicuous mangrove trees near the extremity of Punta Salinas, and these are readily dis-

tinguishable from the north. The point itself is a white sand spit with deep water close to its southern extremity.

**Salinas Bay**,  $1\frac{1}{4}$  miles across and  $\frac{3}{4}$  mile deep, lies on the southern side of Punta Salinas. It is sheltered from winds from north-northeast through east to south-southeast. Depth of less than 3 fathoms (5.5 m.) skirt the shore at about  $\frac{1}{4}$  mile distance.

There are excellent sheltered anchorages in from 3 to 10 fathoms (5.5 to 18.3 m.) over mud southward of Punta Salinas. This bay is the best landing place for seaplanes on the west coast of Paraguana.

**Directions.**—A conspicuous white warehouse is a good leading mark for entering Salinas Bay. To enter, bring this white house on a bearing between  $40^\circ$  and  $70^\circ$  and anchor according to draft. The change from 5 to 3 fathoms (9.1 to 5.5 m.) is very sharp and vessels should avoid having too much speed when approaching the anchorage. There is no current in Salinas Bay and vessels will ride with the wind. The wreck of a small steam vessel is just south of the warehouse.

**Punta Estanques** ( $11^\circ 49' N.$ ,  $70^\circ 18' W.$ ; *H. O. Chart 5437*) is a low, sandy spit with a fishing village on it, and lies 3 miles to the southward of Salinas Point. A shoal with breakers on it extends 400 yards from the end of this point. At low water this shoal is uncovered.

**Bahia Estanques** has a good anchorage in from 5 to 7 fathoms (9.1 to 12.8 m.) over sand and shell. Ships should enter with the conspicuous white house on the cliffs south of the town bearing  $75^\circ$  and anchor according to draft. The church in the center of the town and Mount Santa Ana are also good landmarks.

**Punta Chirreguara.**—From Punta Estanques the coast trends 4 miles  $146^\circ$  to Punta Chirreguara, 45 feet (13.7 m.) high on the north side of the entrance to Amuay Bay. The extremity of this point rises to the Morro of Amuay, a hill about 40 feet (12.2 m.) high.

**Bahia de Amuay** is a well-sheltered anchorage whose entrance lies between Punta Chirreguara and Punta Adaro. This entrance is 1 mile wide but is practically closed by the shoals which extend off each point and by a middle ground with depths of 7 feet (2.1 m.) which lies in the center of the fairway. About  $\frac{1}{2}$  mile east-northeastward of Punta Chirreguara is Morro Nucia, 20 feet (6.1 m.) high.

Vessels should not attempt to enter this bay without local knowledge or the assistance of a pilot.

The village of Amuay, the seat of the customhouse for Las Piedras Bay, is located on the lowland in the northwestern part of Bahia de Amuay.

**BAHIA BOCA DE LAS PIEDRAS (Las Piedras Bay)** ( $11^{\circ} 43' N.$ ,  $70^{\circ} 14' W.$ ; *H. O. Chart 5437*) is a well-sheltered bay in the southeastern part of the Gulf of Venezuela, and is located about 3 miles south-southeastward of Punta Chirreguara.

**Depths.**—There is a depth of 36 feet (11.0 m.) about 700 yards off each of the entrance points of the bay and the 60-foot (18.3 m.) curve is about  $\frac{1}{2}$  mile off the line connecting the points. The 20-foot (6.1 m.) curve follows the contour of the bay at an average distance offshore of about 400 yards.

**Landmarks.**—The conspicuous landmarks seen on approaching the bay are a large water tank painted black with a white "G" on its side and an aluminum-colored roof and 12 crude-oil tanks, painted red, all situated on the eastern shore of the bay. It is expected that other storage tanks will be constructed in the near future.

**Las Piedras Light**, fixed white, 100 feet (30.5 m.) high, visible 8 miles, is shown from the porch of a house on the eastern bluff overlooking the bay.

A fixed red light, visible 5 miles, is shown from the conspicuous water tower. This light is the highest light which can be seen when approaching the harbor at night.

**Las Piedras Pier Lights**, two vertical lights, fixed white over fixed red, 30 feet (9.1 m.) high and visible 8 miles, are shown from the outer end of the pier.

**Shoal.**—A shoal about 200 yards long northeast and southwest and having a depth of 18 feet (5.5 m.) is located  $95^{\circ}$  1,300 yards from the outer pier light.

**Range for clearing.**—The two lights in range bearing  $112^{\circ}$  will pass 400 yards to the northward of the shoal.

**Buoy.**—The northern edge of the shoal is marked by a can buoy painted black and white in checkers.

**Wharf.**—An oil-loading pier 3,500 feet in length has been constructed in Las Piedras Bay. Ocean-going vessels with drafts up to 30 feet (9.1 m.) are berthed on both sides of this pier.

**Anchorage.**—Vessels as a rule do not anchor, but go directly alongside the pier. If required to anchor to await customs or quarantine examination, the best berth is northwestward of and about 1 mile distant from the pierhead in 54 feet (16.5 m.) over mud. The holding ground is bad and ships are apt to drag their anchors unless masters take necessary precautions to prevent it.

**Mooring buoys.**—There are two mooring buoys about 150 yards northward of the pier for the use of vessels going alongside the wharf.

**Wind.**—The strong northeast trades which blow during the winter months sometimes make it difficult to go alongside the pier.

**Tides.**—The mean high-water interval at Las Piedras is 3h. 31m.; mean high-water springs tide 1.0 foot (0.3 m.); neap tides, 0.8 foot (0.2 m.).

**Pilots.**—There are no regular pilots, but the port captain will act as pilot for those not acquainted with the port. He will board the ship some distance from the pier.

His launch is painted in the colors of the Gulf Refining Co., and flies the Venezuelan ensign.

**Directions.**—After passing Aruba a generally westerly set will be experienced, augmented during the winter by the northeasterly winds, so that difficulty may be experienced, especially at night in picking up Las Piedras. In approaching the bay, both by day and night, vessels usually make good course  $112^{\circ}$ , with Las Piedras Lights in line until to the eastward of the 18-foot (5.5 m.) shoal, when they either anchor or go alongside the wharf.

At night, if leaving the pier, it is well to either illuminate the shoal buoy by searchlight or to request the port captain to secure his launch to the buoy and use its lights as an aid in leaving.

**Caution.**—In approaching and leaving Las Piedras Bay it is considered advisable to give the coast a clearance of between 5 and 6 miles in order to have plenty of sea room in which to maneuver to avoid the light-draft tankers plying between the Dutch West Indies and Lake Maracaibo. These small tankers steam in fleets of between 15 and 30 and have little regard for the rules of the road.

Las Piedras ( $11^{\circ} 43' N.$ ,  $70^{\circ} 14' W.$ ; *H. O. Chart 5437*) is a port for the transshipment of crude oil and has no other importance. There is a small village, but no supplies of any description can be obtained. The wharf has oil pipe lines and crude oil can be pumped aboard at the rate of about 900 tons per hour.

**Communications.**—There is telegraphic communication with Amuay and Maracaibo.

**Guaranao Cove.**—Just southward of Punta Carirubano is Carirubano Cove, with a conspicuous brown house on the bluff just to the eastward. One mile further south is Guaranao Cove, where good anchorage may be had 1,000 yards from the shore in about 28 feet (8.5 m.) of water over mud.

**Punta Gorda** ( $11^{\circ} 38' N.$ ,  $70^{\circ} 14' W.$ ; *H. O. Chart 5520*), 4.8 miles  $193^{\circ}$  from Punta Piedras, is high, bluff, and steep to. Vessels may anchor in 10 fathoms (18.3 m.) of water within 500 yards of the shore. From Punta Gorda the coast turns to trend  $150^{\circ}$  for 1 mile to Punta Botija, where the cliffs drop off to a low, sandy beach, which has a considerable indentation to the eastward and then turns southwest to form the low sandy spit known as Punta Cardon. A white church without a cupola,  $\frac{1}{2}$  mile north of the fishing village on Punta Cardon, is the most conspicuous landmark in this

vicinity. A shoal which usually breaks runs almost a mile southwest from the end of Punta Cardon. A well-protected anchorage in 3 to 10 fathoms (5.5 to 18.3 m.) over mud, may be obtained at Punta Cardon with the white church bearing 90°.

**Gulf of Coro.**—At Punta Cardon the coast turns sharply to the east, forming the north shore of the Gulf of Coro. There are no reliable hydrographic surveys of this gulf and it should not be entered except by small boats of not over 4-foot (1.2 m.) draft. A survey has been made of the coast line which is correct. The coast line on the southern shore is undergoing constant changes. The Gulf of Coro is about 30 miles long and 15 miles wide, formed between the southern coast of the Paraguana Peninsula and the mainland. The greatest depth of water to be found is approximately 20 feet (6.1 m.) and then only in very irregular and difficult channels. For a small boat to enter this gulf it requires a search along the bars and reefs at its mouth where in spots 6 feet (1.8 m.) of water may be found to allow passage. The constant sweep of the trade winds over this large shallow body of water causes the water in and to the leeward to be discolored.

The Gulf of Coro is seldom visited save by a few native fishermen, the trade of the city of Santa Ana de Coro being carried on chiefly by way of Vela de Coro Bay.

**Santa Ana de Coro** (11° 25' N., 69° 41' W.).—At the inner end of the Isthmus of Medanos and on its western side, about 5 miles to the westward of the Coro River, is the city of Santa Ana de Coro, the capital of the State of Falcon, with a population of about 10,000. It stands on an arid plain 2 miles from and 100 feet (30.5 m.) above the sea.

**GULF OF VENEZUELA, SOUTHERN SHORE** (*H. O. Chart 5520*).—The southern shore of the Gulf of Venezuela from the Gulf of Coro to the entrance to Lake Maracaibo, trends generally 260° about 85 miles. It is all very low with occasional cliffs and many sandy beaches. There are numerous small streams, most of which are dry except immediately after a rain. Vessels may approach this coast as far as the 5-fathom (9.1 m.) curve which lies about 2½ miles offshore without danger, and there is good holding ground all along the coast, though there is no shelter from the prevailing winds. The bottom is fairly uniform and there is generally sand, although there are stretches of muddy bottom and, inshore, occasional boulders.

**Aspect.**—The mountains of the interior are visible in clear weather from a considerable distance, and from the Cerro de la Teta, 15 miles to the southward of Santa Ana de Coro, the range runs to the southwestward with gradual decreasing elevation as it approaches Lake Maracaibo.

**Punta Cauca** lies on the south shore of the Gulf of Venezuela at the western limit of the Gulf of Coro, 16 miles 190° from Punta

**Cardon.** The bottom is very irregular between these two points, varying in depth from  $4\frac{1}{2}$  to 13 fathoms (8.2 to 23.8 m.)

**Rio Seco.**—Four miles east of Punta Cauca is the small village of Rio Seco. Vessels drawing 18 feet (5.5 m.) can reach Rio Seco.

**Zazarida.**—The coast from Punta Cauca to Punta Penas trends 12 miles  $255^\circ$  and is generally low with sandy beaches. The Zazarida River empties into the gulf just to the westward of Punta Penas, and 3 miles inland is the village of Zazarida, with several large red-roofed buildings. West of Punta Penas the coast dips to the southwestward for 5 miles and then to the westward 19 miles to Point Capana. Point Cienegas, a bluff point with a prominent hill 200 yards inshore from the beach, is 2 miles westward of Point Capana.

**Gutierrez,** 9 miles  $246^\circ$  from Punta Penas, is a landing where a small wharf has been built by the oil companies for landing material. Five small identical houses in a row are just above the wharf. Five miles inland from Gutierrez is the town of Zapatarida.

**Coast.**—The coast from Gutierrez trends about  $260^\circ$  for 14 miles to Punta Capana. In this stretch there is one point which rises to a height of 60 feet (18.3 m.). Thence the coast trends west-southwest, 30 miles with only one conspicuous part which has a height of 38 feet (11.6 m.). Nine miles beyond the conspicuous point, the coast turns westward for 11 miles. The last  $1\frac{1}{2}$  miles of it is studied with dead trees, terminating in dense mangroves. These mangroves make this point prominent from seaward. It is at this point that the coast turns to  $131^\circ$  and becomes the eastern shore of the delta of Lake Maracaibo.

**Barbosa Rock** ( $10^\circ 59' N.$ ,  $71^\circ 29' W.$ ), an old fortress, is located  $1\frac{1}{4}$  miles off shore. At low water the rock is awash and the seas break heavily over it. A white church with a tall steeple marks the town of Casigua, 4 miles inland and 10 miles to westward of Punta Cienegas.

**Barbosa Island.**—Half a mile to the westward of the mainland is an island locally known as Barbosa Island. This island was originally part of Zapara Island, but in 1926 was a separate island about 1 mile wide and  $1\frac{1}{2}$  miles long. The northern half is heavily wooded with mangroves. The channel between it and the mainland is not safe for boats drawing 4 feet (1.2 m.).

**Zapara Island.**—Two miles to northwestward of Barbosa Island, and separated therefrom by mud flats and very shallow water is Zapara Island. This island is  $2\frac{1}{2}$  miles long and is conspicuous from seaward because of sand dunes, which, in its eastern extremity, reach a height of 106 feet (32.3 m.). The westward extremity is marked by the ruins of a tower from which a light was formerly ex-



hibited. Until fairly close to Zapara Island this tower appears to be a black rectangle sitting in the water.

**San Carlos Island**, on the western side of the entrance to the lake, is about 15 miles in length; on the eastern extremity is a white castle and the houses of the pilots. There are many sand dunes covered with vegetation on this island, but none are prominent.

**Bar.**—The outer bar to the entrance to Lake Maracaibo extends immediately northward of Zapara and San Carlos Islands. The eastern extremity being about the middle of Zapara Island and the western extremity about 3 miles to the westward of Fort San Carlos. The bar extends about  $4\frac{1}{2}$  miles northward of Fort San Carlos and, except in the channel, has about 2 feet (0.6 m.) of water over it; seas break heavily over it. The bar is constantly shifting and must be approached very cautiously.

**WESTERN APPROACH, GULF OF VENEZUELA—Punta de Gallinas** ( $12^{\circ} 32' N.$ ,  $71^{\circ} 40' W.$ ; *H. O. Chart 5519*).—From Punto de Gallinas, the northernmost point of the Peninsula de Guajira, the coast trends in a general easterly direction, 6 miles to Punta Taroa. The first 4 miles of this section of the coast is low and difficult to distinguish, but from 2 miles westward to Punta Taroa the coast is rocky with cliffs from 50 to 60 feet (15.2 to 18.3 m.) high.

Southwest of Punta Taroa is a small bay, called Port Taroa, which affords good anchorage for small craft.

The 5-fathom (9.1 m.) curve is  $\frac{1}{2}$  to  $1\frac{1}{2}$  miles offshore along this part of the coast.

**Port de Chimare.**—From Punta Taroa the coast trends east-southeastward 9 miles to the eastern point of Port de Chimare. This port is about  $1\frac{1}{4}$  miles across and  $\frac{1}{2}$  mile deep but being open to the northeast affords no shelter.

There is a rocky islet off the western shore of the bay.

**Dirk Shoal**, with a depth of  $3\frac{1}{2}$  fathoms (6.4 m.), lies 1 mile north-northeastward from the rocky island in Port de Chimare.

**Cabo Falso.**—From Port de Chimare the coast trends about  $107^{\circ}$   $7\frac{1}{2}$  miles to Cabo Falso and is a sandy beach with a few exceptions, with rocky shoals close to the beach and with outlying rocks along the coast. The 5-fathom (9.1 m.) curve is from  $\frac{3}{4}$  to  $1\frac{1}{2}$  miles off the shore.

There is a Colombian customhouse at Cabo Falso.

**Cabo Chichivacoa.**—From Cabo Falso southeastward to the small indentation of Puerto de Lodo, a distance of 4 miles, the coast consists of low sand dunes, some of which are covered with vegetation. Cabo Chichivacoa is bounded by rocky cliffs about 40 feet (12.2 m.)

high. From these southward a distance of 7 miles the coast is made up of sand dunes to Punta Santa Cruz (about half the distance to Punta Espada). Thence to Punta Espada the coast is rocky in places and low in others, inland there being many hills and small mountain ranges.

**Los Monges (The Monks)** is the name of a group of small but rather high barren islets lying off the entrance to the Gulf of Venezuela. Bearing  $56^{\circ}$  from Cabo Chichivacoa, distant 22 miles, lies a group of five rocks known as the North Monks, about 135 feet (41.1 m.) high; there are no off-lying dangers within  $\frac{1}{2}$  mile of these rocks.

The South Monks ( $12^{\circ} 22' N.$ ,  $70^{\circ} 54' W.$ ), the two southernmost, about 230 feet (70.1 m.) high, which are close to each other and steep to within 100 yards, lie  $172^{\circ}$  from North Monks, a distance of  $7\frac{1}{2}$  miles. Bearing  $57^{\circ}$  from South Monks, distant  $3\frac{1}{4}$  miles, is the East Monk, about 180 feet (54.8 m.) high, which is equally bold. All groups of The Monks are difficult to distinguish at night. The channels between the North, South, and East Monks and between the whole group and the mainland are free from known dangers.

**WESTERN SHORE—GULF OF VENEZUELA.**—The western side of the gulf is bounded by the Guajira Peninsula, belonging to the Governments of Venezuela and Colombia. At the northern and eastern side of this peninsula is a series of mountain ranges working in from the coast. A range which is about 13 miles inland has several high peaks, the most prominent of which is 2,690 feet (819.9 m.).

**Depths.**—From Cabo Falso to Cabo Chichivacoa the 5-fathom (9.1 m.) curve is about 1 mile offshore. From Cabo Chichivacoa to Punta Espada, a distance of 14 miles southeastward, the 5-fathom (9.1 m.) curve is about 1 mile offshore.

**Punta Espada** ( $12^{\circ} 05' N.$ ,  $71^{\circ} 07' W.$ ; *H. O. Chart 5520*).—From Punta Espada the coast trends southward for 2 miles with the 5-fathom (9.1 m.) curve 1 mile offshore; thence to Punta Tucacas the coast trends southwestward for a distance of 12 miles and the 5-fathom (9.1 m.) curve varies from 1 to  $2\frac{1}{2}$  miles offshore.

A conspicuous pyramidal peak is 7 miles west of Punta Santa Cruz; approaching Punta Espada from the north it is very indistinct but is easily identified when approaching it from the south, there being a 100-foot (30.5 m.) tower near the point. The coast is abrupt and rocky from Punta Espada south for 8 miles.

**Punta Peret** (*H. O. Chart 5438*) is 9 miles south-southwestward of Punta Tucacas, and the 5-fathom (9.1 m.) curve varies offshore from  $2\frac{1}{2}$  miles at Punta Tucacas to  $\frac{1}{2}$  mile at Punta Peret. The

bottom is irregular, due to coral, and the coast should be approached with caution.

**Castilletes anchorage** can be easily identified by flat-topped cliffs, two of which are close to the shore east of Castilletes village and three of which are  $1\frac{1}{2}$  miles west of the village. There is also a conspicuous white Indian cemetery approximately 2 miles west of Punta Peret. South of the entrance to Cocinetas Lagoon are the Fuertes, three conspicuous black rocks, the highest 48 feet (14.6 m.) in height being  $\frac{3}{4}$  mile offshore. Approaching this anchorage the bottom is irregular, due to growing coral heads. Due to constant trade winds from the northeast, the coast from Cabo Falso to Punta Peret is to be avoided for anchoring.

**Coast.**—Between Punta Peret and San Carlos Island, at the entrance to the Lake Maracaibo, is Calabozo Bay. From Punta Peret to the head of the bay the 5-fathom (9.1 m.) curve is about 3 miles offshore; the bottom is coral and gray sand. There are a few conspicuous sand dunes and several mountain ranges with well-defined peaks, the principal one being Teta Guajira 1,300 feet (396.2 m.) high, 6 miles inland from the head of the bay and standing off by itself. From Punta Peret to position south of Teta Guajira the coast affords good boat landings and good ship anchorages, as it is in the lee of the trade winds. Boats landing should be cautious of coral heads close inshore. On the western side of Calabozo Bay the 5-fathom (9.1 m.) curve is  $2\frac{1}{2}$  miles offshore; landing is impracticable, due to surf extending as far as 1 mile offshore. The shore is very low, with a sandy beach, and there are no conspicuous mountain peaks in this section.

**Icarus Shoal** is a patch  $\frac{1}{4}$  mile wide and  $\frac{1}{2}$  mile long, with  $\frac{1}{4}$  fathom (0.5 m.) of water bearing  $60^\circ$  from Punta Tucacas, and lying  $5\frac{1}{2}$  miles inside the 5-fathom (9.1 m.) curve and 1 mile offshore.

**Anchorage.**—Ships sometimes have to wait a considerable time for a pilot, and for this purpose anchorage can be taken up with the highest hill on Toas Island bearing  $195^\circ$ , Barbosa Roco bearing  $132^\circ$ . It is to be observed, however, that during the strength of the sea breeze, when at times it blows half a gale of wind, the riding is very heavy and requires good ground tackle.

**Tides.**—The mean high-water interval at the entrance to Lake Maracaibo is 4h. 54m.; mean high-water spring tides rise 2.5 feet (0.8 m.); neaps, 2.3 feet (0.7 m.). In the rainy season, the tide is said sometimes to rise 4 feet (1.2 m.), at which time the ebb runs with considerable strength.

**Directions.**—**From the eastward.**—Steamers proceeding through the Gulf of Venezuela to the entrance of Lake Maracaibo should

pass about 5 miles northward of Cape San Roman on a westerly course and continue until Jamanoba Hill on Aruba, 617 feet (188.1 m.) high bears  $40^{\circ}$ , when course should be altered to the left to put this hill astern and course continued until Punta de Macolla Light is abeam to port, distant 3 miles, when course should be altered to make good  $232^{\circ}$ , which will lead to the anchorage off the bar at the entrance to Lake Maracaibo.

These directions are equally good at night for the lights on either end of Aruba, which apparently, are visible a greater distance than shown on the chart and Punta de Macolla Light can be used to fix the ship's position.

Sailing vessels should proceed as described above until abeam of Punta le Macolla Light when course should be maintained.

On reaching a depth of 7 fathoms (12.8 m.) a more westerly course must then be taken, running along the land at a distance of about 6 miles, guided by the lead, and taking care not to come into less than 6 fathoms (11.0 m.), to avoid the quicksands off the mouth of the delta. The water will occasionally be discolored in patches, but there is no danger, provided the above depth be maintained. On advancing westward, the first remarkable objects seen will be three hills, West Hill, Middle Hill, and High Hill, 365 feet, 300 feet, and 420 feet (111.3, 91.4, and 125.6 m.) high, respectively, on Toas Island, situated about 2 miles southward of San Carlos Island and visible for a distance of 27 miles. Eastward of these is East Toas, 230 feet (70.1 m.) high. When it bears  $222^{\circ}$  Fort San Carlos, on the eastern end of San Carlos, will be seen under it.

**From the westward.**—The coast of the Peninsula de Guajira should be skirted at a distance not closer than 5 miles until about 5 miles eastward of Punta de Espada. The vessel's position during daylight hours can be checked by cross bearings on the Monks. When abreast of Punta de Espada, the course should be altered to the right to pick up the land to the westward of the bar. The soundings will gradually decrease and the first land sighted will be Toas Island.

It is not advisable to attempt to make the bar at the entrance to the Lake Maracaibo at night. Every effort should be made to arrive at dawn.

In working out of the gulf, it should be borne in mind that off-shore the wind generally shifts to the northward at 4h. or 5h. p. m.; therefore endeavor should be made to get near the western shore about that time, so as to be able to make a long board to the eastward before the wind draws around in that direction. By paying attention to these changes a vessel will work out quickly.

**Caution.**—The hydrography of the Gulf of Venezuela and the entrance to Lake Maracaibo as shown on existing charts is only approximately correct. Mariners are therefore advised to proceed with caution in this locality until a new chart is issued.

**LAKE MARACAIBO ENTRANCE** ( $11^{\circ} 02' N.$ ,  $71^{\circ} 40' W.$ , *H. O. Chart 5520*).—The channel into Lake Maracaibo began about 5 miles,  $320^{\circ}$ , from Fort San Carlos in 1926 and ran close to the northeastern shore of San Carlos. The western extremity of Zapara Island is designated by the ruins of a tower.

**Toas Island.**—Southward of San Carlos is situated the conspicuous island with three hills of 300 feet, 365, and 420 feet (91.4, 111.3, and 125.6 m.) in height, and one near the eastern extremity 230 feet (70.1 m.) high. Two miles southeast of Toas Island is a small island called Pescaderos.

**The channel** across the outer bar is narrow, with a bottom of shifting sand, and trends in a generally southeastern direction. In the fall of 1927 this channel carried a least depth of 14 feet (4.3 m.). Often a heavy surf is breaking on the bar, and it is dangerous during and after heavy weather.

**Range marks and buoys.**—There are leading marks on the beach of San Carlos Island and on Toas Island maintained by reliable local interests in Maracaibo. This channel is also marked by seven buoys, numbered one to eight, odd to starboard and even to port in entering.

The character and position of the leading marks and the position of the buoys are frequently shifted to conform with the constantly changing channel.

**Channel for inner bar.**—About midway between the bar and the city is the Tablazo Bar, where the channel becomes tortuous, and for about 8 miles there are shoal spots, with from 11 to 12 feet (3.4 to 3.7 m.) of water on the eastern side. This channel is marked with cane poles with brush tops on the eastern side, and at the most difficult turning point there is a similar mark on the western side. While the water is very shallow it is usually smooth and free from swell, therefore not dangerous for a ship drawing  $10\frac{1}{2}$  feet (3.2 m.) and this should be considered the maximum draft which can enter. Once across Tablazo Bar there is 23 feet (7.0 m.) to the lower end of the pier at the town.

Passage over Talbazo Bar should be made a little before high water, so as not to lose the tide in case of grounding.

**Pilots.**—The pilot service for the bars of Maracaibo and the approach to the city is under the direction of the collector of customs at Maracaibo. It comprises 2 chiefs and 13 pilots.

It is reported that pilots should be watched carefully. For ships drawing less than  $10\frac{1}{2}$  feet (3.2 m.) the pilots are considered satisfactory, but are not considered very reliable for greater drafts. For masters who have demonstrated their knowledge of these waters and received permission to pilot their vessels over the bars pilotage is not compulsory, but after leaving San Carlos and proceeding up to Maracaibo pilotage is compulsory.

Pilots reach the outer bar in their own sailing boats but must then be transported to the vessel to which they are going in that vessel ship's boat.

When there is a flat calm or when there is a heavy sea running, pilots may not be had for four or five days at a stretch. There is a large fleet of light-draft tankers running into and out of Lake Maracaibo daily. Vessels unable to get pilots and compelled to enter should, if of no greater draft, follow very closely on the heels of a tanker and conform exactly to her every movement. The fleet of tankers have a few local signals, among which three short and one long blast mean "am slowing down," and two long blasts mean "go ahead."

Pilots will not take a ship through the bar channels at night.

**Directions.**—The best time for a vessel to cross the bar is about 9 a. m., when the wind has moderated and the sea is comparatively smooth, for during the strength of the breeze the surf breaks with great violence.

Should a vessel unfortunately ground on the bar she will be placed in imminent danger; being a quicksand, no dependence can be placed on anchors to heave off by. The bar must not be approached at night.

Sailing vessels usually sail in, but outward towage is reported to be compulsory.

Masters of ships that are not regularly trading in and out of Maracaibo Lake, and who therefore are not conversant with the changes that take place from time to time in regard to the leading marks (the Bar Head continually extending to the northwest) should not attempt to cross the outer bar without a pilot.

At present pilots put out from the Fort of San Carlos in a small sloop.

The Outer Bar should be approached with the Highest Hill of the Isla de Toas bearing  $185^\circ$ , but a ship should not approach within 2 miles of the shore.

In 1927 not more than 14 feet (4.3 m.) could be carried over this bar. The distance from the bar to the city is 27 miles.

**MARACAIBO** ( $10^\circ 38' N.$ ,  $71^\circ 37' W.$ ), the second largest city in Venezuela, and the capital of the Province of Zulia, is located on the western side of the straits connecting the Gulf of Venezuela with Lake Maracaibo.

The city at present is undergoing an oil boom and is growing much faster than its facilities can accommodate.

In 1926, the population was about 75,000.

The United States is represented by a consul and a vice consul.

**Harbor facilities.**—The harbor equipment is very deficient and is in no way proportionate with the amount of shipping being handled. There is a small broken-down quay where two or three seagoing vessels can berth. Vessels berthing must do so under their own power and without outside assistance. Ships must wait for days for room alongside the wharf and after securing a berth, frequently must wait an additional time for warehouse accommodations.

There are some barges on hand but not sufficient to supply the demand.

There is one mooring buoy in the harbor which may be rented.

**Shoal.**—There is a shoal spot having from 7 to 9 feet (2.1 to 2.7 m.) of water between the two wharves.

**Harbor improvements.**—The Venezuelan Government has contracted to build additional wharves and warehouses to alleviate the existing conditions, but in 1927 this work had not been started.

**Supplies.**—Fresh meat, vegetables, and bread can be obtained, but are not plentiful; imported goods are expensive. The seine may be drawn anywhere in the sandy bays, but alligators are numerous.

**Water.**—At Maracaibo the waters of the lake are fresh enough for use in boilers and to serve for washing, but not potable. Drinking water can not be had in quantities, although a small amount might be obtained if urgency required it.

**Coal.**—The nearest coaling station is at Curaçao.

**Fuel oil.**—Maracaibo, although not a fueling port, exports large quantities of fuel oil, and fuel oil could possibly be obtained from oil companies in cases of emergency.

**Repairs.**—Small repairs can be executed to machinery at the electric-light plant.

**Communication.**—A regularly weekly mail steamer service is maintained by the American Red D Line between Maracaibo, New York, Porto Rico, Curaçoa, and the central ports of Venezuela. A steamer of the Caribbean Steamship Co., also one of the Royal Dutch Mail, maintain a regular service between New York, West Indies, Venezuelan coastal ports, Curaçao, and Maracaibo. There is also coastwise and lake service.

There are three short railroads connected with the lagoon—the Tachira Railroad connected at Encontrados, a line starting from Puerto La Ceiba, and one starting from Santa Barbara, on the Escalante River, on the southern shore.

Maracaibo is connected by telegraph cable with Vela de Coro. There is a telephone system.

**Radio.**—There is a radio station open to the public. (See International List of Radio Stations.)

**Climate.**—The climate of Maracaibo is fairly good in the winter or dry months, and not at all unbearable as regards heat, but in summer is unhealthy and wet-season fevers prevail.

Crews of vessels, especially those loading high up in the lake, should take every precaution against unnecessary exposure. The sanitary conditions in and around Maracaibo are poor.

**Hospital.**—Casa de Beneficencia is recommended for seamen.

**Customs regulations.**—While the ship remains in port a customs official remains on board and must be taken care of. The following customs regulations are to be especially noted: No cargo can be transferred to barges nor can any cargo be accepted without the permission of the customs authorities. Cargo spaces which are not yet empty may not be used for new cargo. However, if any empty room is used for new cargo before the ship's cargo has been entirely unloaded, this room must be inspected by the customs authorities. After the ship's cargo has been all unloaded, a general inspection is made of the supply rooms and quarters of the crew.

**LAKE MARACAIBO** is a large basin connected to the sea by a narrow strait of shallow water about 40 miles long. The lake, which is nearly 100 miles long north and south and about 60 miles wide, has many points of similarity with the delta of the Orinoco both in hydrography and in general character. Innumerable rivers and small

streams drain into the lake from all sides. The lake is fresh water. Information about the lake is scarce.

**Depths.**—The depth of the lake is estimated to be about 80 fathoms (146.3 m.) but its navigation is confined to vessels drawing not more than 11 feet (3.4 m.).

**Encontrados.**—A service of paddle steamers, tugs, etc., is maintained on the lake, plying between Maracaibo and Encontrados on the River Zulia, the mouth of the latter being dredged to 8 feet (2.4 m.).

**Cabimas,** on the northeastern shore of the lake, has a good landing pier. Water and ice can be obtained. The pilot, obtained at Maracaibo, remains on board and takes the vessel back.

**La Ceiba** is a semicircular bay situated near the southeastern end of the lake. It has a bottom of soft mud and depths of  $2\frac{1}{2}$  to 3 fathoms (4.6 to 5.5 m.).

**Wharf.**—There is a wharf about 460 feet in length. Vessels moor with a stern line to a mooring buoy and a bow line to the wharf.

**Light.**—There is a fixed white light, visible 2 miles, located at the southwestern extremity of the wharf.

**DIRECTIONS FOR COAST NAVIGATION.**—Although these directions were primarily written for sailing vessels they contain much that will be useful to a steamer.

The coast between Trinidad and the Guajira Peninsula, being under the influence of the trade wind, may be considered perfectly safe as far as wind is concerned. Hurricanes are unknown, and northers, if they do occur, never exceed the strength of the ordinary breeze.

During the rainy season, May to November, there are sometimes strong southerly squalls with heavy rain, but as they blow offshore do but little injury.

Westward of the Guajira Peninsula, especially from Cape San Juan de Guia, the trade winds are exceedingly strong, so much so that they may be considered as real gales; and from June to November the wind sometimes shifts to south and southwest.

As a general rule on this coast, as well as in the whole of the Caribbean Sea, vessels should make the land well to windward of the port of destination, to prevent the trouble and delay consequent upon getting to leeward of it.

Vessels coming from North America to any ports leeward of Curacao should enter the Caribbean Sea by Mona Passage, and if bound to ports to windward of that island by the channels eastward of the Virgin Islands.

If bound to either Margarita Island or Cumana the coast should be closed with about Cape Tres Puntas, passing in preference through



the channel between Margarita and the mainland. This route also appears preferable if bound to Barcelona, although there can be no objection to going to the northward of Margarita; if pursuing the latter course a wide berth should be given to the foul ground situated southward of the Testigos.

Vessels bound to La Guaira from Cumana or Barcelona should shape a direct course for Cape Codera, passing between Tortuga and the coast; but those coming from Europe, or any of the Windward Islands, to that port, should pass to the northward of Tortuga to approach the coast about the same cape, or a little to leeward of it, taking care to sight Centinella Island, which lies to the northward of the cape. If bound to Puerto Cabello it will not be so necessary to make Cape Codera, as any other point on the coast will answer the same purpose, provided it be sufficiently to windward of their port.

To make Cape Codera, or any harbor upon the coast to leeward of it, a vessel may pass through any of the channels between the islands to the northward of the coast.

Vessels bound to Maracaibo from the eastward should sight Cape San Roman, and those from the westward should make Point Espada. In running for Cape San Roman they may pass either to the northward or southward of Curaçao.

Should the course to Cape San Roman be taken outside the islands, it should be recollected that Los Roques and the Islas de Aves are dangerous on their northern sides, and that the northwestern end of Bonaire Island may be mistaken for that of Curaçao.

To avoid these dangers, especially in the night, every opportunity should be taken to check the latitude, and due allowance made for currents which have been experienced during the day. Attention to these remarks is important, as the currents in this part of the sea are strong and variable.

**In working to windward** on this coast, from the Gulf of Venezuela to Margarita or Trinidad, a vessel should take advantage of the daily variation of the trade wind, which about midnight or somewhat sooner comes offshore from about east-southeast or even south-east, and between 9 and 11 in the forenoon becomes a sea breeze from east-northeast, which variations take place at considerable distances from the shore. If when approaching the land a vessel can not continue on the port tack until the wind veers to the southeastward, short tacks should be made alongshore until it does so and then again stand out to sea. By these means two long stretches may always be made, one to the northeastward during the night, the other to the southeastward during the day. By working to windward on short tacks close along the shore this advantage can not be obtained, be-

cause the wind nearly always blows along the coast; although there may be a light land wind in the night and before the sun rises (during the season of the rains), it does not last and affords but little assistance.

Small vessels, however, which can not proceed upon this system when the strong breezes prevail, which from Cape Aguja to Fuerte Island are like gales with a rough sea, must keep in near the coast where the water is smoother. But large vessels well equipped should follow the course already pointed out.

If the current near the shore is found to be running strongly to the westward, it is recommended to work up northward of latitude  $15^{\circ}$  north, as it is said the strongest westerly current is found between  $12^{\circ}$  and  $15^{\circ}$  north. Much depends on the position of the vessel with regard to the desired port.

## CHAPTER IX

### CURAÇAO, A COLONY OF THE NETHERLANDS

#### (ISLANDS OF CURAÇAO, BONAIRE, AND ARUBA)

**General remarks.**—Curaçao consists of two groups of three islands each. Those in the Leeward Islands, Saba, St. Eustatius and the southern half of St. Martin have previously been described; while Aruba, Curaçao, and Bonaire will be described in this chapter.

**Government.**—The government of the Dutch West Indies is lodged in a governor, appointed by the Crown, assisted by an administration counselor and a colonial counselor. The seat of the government is located at Willemsted, on the island of Curaçao. Each of the other islands is governed by a director appointed by the governor.

**Population.**—The population of the entire colony is about 58,000, of whom about 5,000 inhabit the Leeward Island group.

**Time.**—The Dutch West Indies keep the time of the meridian  $69^{\circ}$  W., which is 4h. 36m. slow on Greenwich civil time.

**Current.**—South of Curaçao the surface current is generally to the westward, but an easterly subsurface current exists, and this is of such volume that it is apt to overcome entirely the surface set.

**BONAIRE** ( $12^{\circ} 12' N.$ ,  $68^{\circ} 15' W.$ , *H. O. Chart 964*), situated 50 miles north-northeastward from Punta del Ubero, is the most eastern of the colony of Curaçao, Dutch West Indies. From its most southern point, Lacre Point, to its most northern extremity, North Point, the island is 20 miles long in a generally northwestward and southeastward direction, with an average width of 4 miles.

The coast of the island is bold and steep-to, with ocean depths only a short distance offshore. The water is very clear and bottom can be seen at a great depth.

The population of the island is about 5,200, the greater percentage of whom are colored.

**Aspect.**—The northern portion of the island is rugged, uneven, and of moderate elevation, the highest part being at the northwestern extremity; the hill over the latter point is known as Brandaris which is the highest on the island, having a height of 787 feet

(239.9 m.), and so much resembles Mount San Christoffel at the western end of Curaçao, that mariners are apt to mistake the one for the other. The trees on some parts grow in high clumps and when first seen have the appearance of martello towers. A settlement a little to the southward of Brandaris has apparently a good reef harbor.

On the eastern coast the land is low, which continues to the southern point of the island, which is low and sandy.

**North Point Light.**—A group flashing white light, unwatched, 146 feet (44.5 m.) above high water, visible 18 miles, is exhibited from a square gray tower with dwelling attached 37 feet (11.3 m.) high, located on the top of the hill Soroe Bentano, on the northwestern point of Bonaire. (See Light List.)

**Boca Spelonk.**—From North Point the east coast trends about  $126^{\circ}$  for 8 miles. Then the coast turns and trends  $95^{\circ}$  for 5 miles to Boca Spelonk, the most eastern point of the island.

**Boca Spelonk Light**, flashing white, 100 feet (30.5 m.) above high water, visible 12 miles, is exhibited from a cylindrical white stone tower, 69 feet (21.0 m.) in height, situated on the northeastern extremity of the island. (See Light List.)

The visibility of this light is variable because of salt deposits, which constantly form on the lenses of the light.

**Lacre Point.**—From Boca Spelonk the coast trends southward for 13 miles to Lacre Point, the southern extremity of Bonaire, which is a low rocky spit of land terminating in a sand and coral reef.

**Lacre Point Light**, fixed white, 72 feet (22.0 m.) above high water, visible 12 miles, is exhibited from a tower, 66 feet (20.1 m.) high, with three red vertical stripes on it, located near the extremity of the point. (See Light List.)

**Little Bonaire** (*Plan on H. O. Chart 2154*).—In the bight on the western side of the island, about  $\frac{1}{2}$  mile from the shore, is an islet named Little Bonaire. The islet is low and rocky; the town of Kralendijk can be seen over it from seaward.

**Kralendijk Roads** ( $12^{\circ} 10' N.$ ,  $68^{\circ} 17' W.$ ), between Bonaire and Little Bonaire is about 800 yards wide at its narrowest point, which is about 1 mile northwestward of the town. The roads are very deep just up to the shore.

**Landmarks.**—The radio masts, the church, a tree to the southward of the town, and a white house at Paloe Lechi are the conspicuous objects in approaching from the southward.

**Kralendijk Light**, fixed white, 29 feet (8.8 m.) above high water, visible 4 miles seaward, is exhibited from a square yellow stone tower 23 feet (7.0 m.) high on Orange Battery. (See Light List.)

**Anchorage.**—The shores of Bonaire are so bold that there are apparently only two anchorages; one off the town, in 17 fathoms (31.1 m.), over sand and coral, at 300 yards from the shore, and the other in about 20 fathoms (36.6 m.) at the same distance from the northwestern shore of Little Bonaire.

In making use of the former the bank is so narrow and precipitous that it requires care and skill in a sailing vessel not to shoot in too far, and not to bring up too short, to risk dragging the anchor into deep water.

**Caution.**—In approaching the anchorage, due to the narrowness of the shelf upon which it is necessary to anchor, larger vessels should proceed at steerageway only, with the anchor ready to be dropped instantly.

**Pier.**—There is a small landing pier extending about 66 feet from the shore to which small vessels may secure.

**Light.**—A fixed red light, visible 1 mile, is shown from the end of the pier.

**Mooring buoys.**—There are three mooring buoys in the roads to which small vessels may secure.

**Directions.**—A vessel may pass in or out of the road on either side of Little Bonaire, but the southwestern channel will be found the most convenient.

**Kralendijk**, the seat of government of the island of Bonaire, is abreast of Little Bonaire. It has no commercial importance.

**Radio station.**—There is a radio station in this town, open to public use.

**Coast** (*H. O. Chart 964*).—From Kralendijk the coast of Bonaire trends west-northwest about 10 miles to the most western part of the island and thence northward 6 miles to North Point.

**Mooring buoy.**—A mooring buoy, for the use of coasting vessels, has been laid 330 yards off the beach, in the anchorage off Plaza Frans, on the west coast of the northern portion of Bonaire.

**Little Curaçao** ( $12^{\circ} 00' N.$ ,  $68^{\circ} 39' W.$ ; *Plan on H. O. Chart 2154*) is a very low islet of coral, situated 25 miles westward from Lacre Point. All the guano has been removed from the island, and it is now utterly bare and even less conspicuous than before, being but little above the water's edge.

It is about 2,700 yards in length, north and south, by 800 yards breadth, and very steep-to, especially on the eastern side, where there is no bottom at 40 fathoms (13.2 m.) within 100 yards of the coast, and there is deep water all round at a distance of 400 yards.

**Little Curaçao Light**, group flashing white, 82 feet (25.0 m.) above high water, visible 15 miles, is exhibited from a white cylindrical tower 66 feet (20.1 m.) high, between two 2-story houses with red roofs erected on the middle of Little Curaçao.

**CURAÇAO** ( $12^{\circ} 10' N.$ ,  $69^{\circ} 00' W.$ ; *H. O. Chart 964*)—**General remarks.**—This island was settled by the Spaniards early in the sixteenth century; it was taken by the Dutch in 1632, and after changing hands with the English for two short periods, was finally given up to the Netherlands in 1814.

It has the advantage of possessing one of the finest and most commodious harbors in the West Indies, with ample depth for all classes of vessels. It is a distributing center for merchandise from Europe and other countries and serves as a point for the transshipment of the products of Venezuela and Colombia.

In 1926, the population of the island was about 38,800. The island is 32 miles in length in a northwesterly and southeasterly direction, about 6 miles across at its greatest breadth, and of considerable elevation. The Tafelberg (Table Mount), about 4 miles westward of Cañon Point, comes first in sight when making the island from the southeastward, and has the appearance of a separate island; Mount Sta. Cataloña (Ronde Klip), on the southeastern shore, and San Hieronymus and San Cristoffel Mountains on the western part, are also conspicuous objects. The latter, which is situated about 4 miles from the northwestern extremity of the island, is 1,235 feet (376.4 m.) high. The surface is generally rocky and barren, yet in some parts it produces in perfection the finest fruits of the West Indies.

The northern coast of the island is everywhere bluff, free from danger, and steep-to; and its rocky shores almost overhang the sea, which breaks on it with considerable violence at times. The southern side is bordered by a bank of sand and coral, which extends off about 200 yards. (See view 13, Appendix V.)

**Climate.**—Curaçao is very dry and its lack of rain works a serious handicap on the inhabitants. The average rainfall is about 22 inches per year, and this is variable from year to year. Normally September is the rainiest month and May the driest.

The mean temperature of the island is about  $78^{\circ} F.$ , the mean daily maximum being  $86^{\circ} F.$ , and the minimum about  $70^{\circ} F.$

**Current.**—Current observations were made off the entrance to Santa Anna Bay, at distances of from 100 to 500 yards offshore during the period January to September, 1925. No observations were made during the last quarter of the year, as the current never attained any great strength. The observations lead to the conclusion that the current is usually of little strength and variable in direction, but at times sets with appreciable strength to the westward. During the observations a rate of 1 knot or over occurred on 22 days; on only 4

days did the rate exceed 2 knots, the maximum being  $2\frac{1}{2}$  knots; during such periods the stream ran continuously to the westward.

A sailing vessel bound to Curaçao from the westward might possibly do well to try the direction of the current off the mainland first, as it is sometimes found running to the eastward; but should it be otherwise, she will do better by standing out at once, and working up northward of latitude  $15^{\circ}$  N., as the strongest currents are said to be found between latitude  $12^{\circ}$  and  $15^{\circ}$  N. This latter route should be adopted from Jamaica, more especially in the autumn, when there is at times a westerly current southward of the Island of Haiti, and getting eastward of the meridian of Curaçao, before standing southward.

Approaching from the northward, the eastern extremity of Curaçao, which is very low, should be given a wide berth, as the current sets toward it from the eastward with considerable strength, as above mentioned.

**Directions.**—Vessels from the eastward will first sight either the light on Little Curaçao, or Tafelberg. The southern side of the island should be navigated at the distance of 1 or 2 miles.

Vessels bound to the harbor of Santa Anna from St. Thomas, or from the northward, generally endeavor to sight the high land at the northwestern extremity of Bonaire Island, in order to be well to windward; but, as the Brandaris Peak on that island so much resembles Mount San Christoffel, at the western end of Curaçao, care must be exercised that they are not mistaken for each other as has often been the case.

**At night.**—It may be advisable for sailing vessels after passing Cañon Point, the eastern end of Curaçao, and unable to reach the port in daylight, to lie-to at a prudent distance offshore westward of Little Curaçao Light abreast the Tafelberg, heading to the southward, or to stand off and on until morning. The land at Hala Canoa,  $1\frac{1}{2}$  miles westward of Cañon Point, is low and difficult to be distinguished at night, and should be given a wide berth.

**Harbors.**—On the southern shore is situated the fine harbor of Santa Anna, where the whole commerce of the island is carried on. There are also several small harbors and coves, one of the best of which is Spanish Haven and Caracas Bay, on the southern side, about 5 miles to the eastward of Santa Anna; they may be recognized by a fort and flagstaff.

**Other anchorages.**—Good temporary anchorage may be obtained in Sta. Cruz, Port Marie, St. Michaels, and Pescadores Bays; all of these are on the southwestern side of the island. The banks of soundings in these bays are steep-to, and do not extend far from the shore; the bottom is chiefly sand.

**Cañon Point** is the most southeastern point of the island. It is planned to put a group flashing white light on this point at some time in the near future.

**Fuik Bay** ( $12^{\circ} 03' N.$ ,  $68^{\circ} 51' W.$ ; *Plan on H. O. Chart 2154*), near the southeastern end of Curaçao about 5 miles westward from Cañon Point, is a bay about 1,500 yards long and widths varying from 175 to 400 yards. However, the entrance, which has depths of  $3\frac{1}{2}$  fathoms (6.4 m.) is less than 75 yards wide and as the turn into the bay is very sharp, the bay has no practical use as an anchorage for other than small craft.

**Buoys.**—The entrance channel to Fuik Bay is marked as follows:

On the eastern side, by two white conical buoys, and within the entrance by a white barrel buoy.

On the western side by two red conical buoys.

**Spanish Haven** ( $12^{\circ} 05' N.$ ,  $68^{\circ} 51' W.$ ; *H. O. Chart 1215*), about 6 miles northwestward from Canon Point, has good anchorage, but the entrance to Spanish Haven is very narrow, being barely 35 yards wide between the 3-fathom (5.5 m.) curves. For nearly 1 mile the channel continues very narrow, when it opens into Spanish Water covering a considerable space with regular soundings of 6 to 7 fathoms (11.0 to 12.8 m.). Three shallow bays branch off to the northward. A southern branch of Spanish Water is separated from Caracas Bay by a narrow strip of land.

**Caracas Bay** (*H. O. Chart 1215*), just to the westward of Spanish Haven, is large and open between Point Juba on the east and Lyhoek (Leeward Point) on the west. The bay is about 1,300 yards across and about 1,000 yards deep. In its center the depths of the bay are in excess of 50 fathoms (91.4 m.), while the 30-fathom (59.9 m.) curve skirts the eastern shore at an average distance of about 100 yards.

The rights to the bay have been acquired by the Curacaosche Petroleum Co. for a fuel-oil depot and is now used for all vessels which can not for any reason enter Willemstad.

**Buoy.**—A buoy, showing a flashing red light, visible 6 miles, is moored about 50 yards south of Lyhoek.

**Wharves and dolphins.**—Three piers, with deep water alongside, have been constructed by the petroleum company on the eastern side of the bay. Each of the piers have a series of dolphins at approximately  $90^{\circ}$  to the line of the piers and vessels secure to these dolphins to load or discharge petroleum products

The most northern pier, called "V Pier," is about 120 yards long, and vessels with lengths not exceeding 550 feet secure port side to the dolphins and are held in position by four mooring buoys, two ahead and two astern.



The middle and southern pier called "X" and "Z" Piers, are 90 and 50 yards long, respectively, and have the same system of dolphins as V Pier, and vessels up to 800 feet in length go to these piers, securing in the manner previously described.

**Caution.**—Due to the prevailing winds, stout lines are required to hold vessels in position alongside dolphins.

**Anchorage.**—Vessels can anchor in 20 fathoms (36.6 m.), with Fort Beekenburg, which is 80 feet (24.4 m.) high, bearing 27° distant 175 yards.

**Winds.**—The high land to the northeast and east affords good protection from the prevailing northeast trade winds, which blow constantly here except during the months of August, September, and October. During these three months the winds are variable but do not interfere with loading of cargo.

**Pilot.**—Pilotage is compulsory to the docks, but not away from them. The petroleum company furnishes a pilot who will dock ship, either day or night. Pilots have their own motor launches.

**Tug.**—There is one tug available to assist in docking and undocking ships.

**Supplies.**—Petroleum products can be obtained in unlimited quantities. Other supplies can be obtained from Willemstad.

**Water** is very scarce, but in case of necessity small quantities for drinking purposes, which should be boiled, can be obtained from the petroleum company.

**Communications.**—There is an excellent road and telephone service between Caracas Bay and Willemstad.

**SANTA ANNA BAY** (12° 06' N., 68° 56' W.; *H. O. Chart 1049*) is the location of Willemstad, the capital of the Dutch West Indies. The bay consists of a channel 110 to 325 yards in width, at right angles to the direction of the coast and extending about 1,650 yards into the island, where it opens out into a wide bay called the Schottegat. Although the Schottegat is quite extensive, the greater part of it is islands and reefs, the central part, about 325 yards in diameter, being clean.

About 300 yards from the entrance Santa Anna Bay is spanned by a pontoon drawbridge.

**Depths.**—The entrance channel has depths of from 11 to 14 fathoms (20.1 to 25.6 m.), with 7½ fathoms (13.7 m.) in the narrowest part of the fairway. The Schottegat carries from 8 to 11 fathoms (14.6 to 20.1 m.), but there is one patch of 5 fathoms (9.1 m.) in the western part of the anchorage and another with 1½ fathoms (2.7 m.) in the eastern part. All the islets and points are fringed by shoals.

**Buoy.**—The shoal patch in the eastern part of the harbor is marked by a red buoy, moored on its western edge.

**Landmarks.**—In approaching from seaward, the prominent landmarks are the radio masts, Fort Amsterdam, the oil works at Asiento, Fort Nassau, 223 feet (68.0 m.) high, and the bridge across Santa Anna Bay.

**Pontoon bridge.**—A pontoon bridge spans the harbor between Willemstad and Otrabanda; the standing portion is on the western side. Two of the pontoons on the Willemstad side are equipped with winches for use in opening the bridge. Steam is kept on the winches night and day. Vessels can pass through any time by giving short notice.

The bridge is closed daily from 8 to 8.30 a. m., from 12 to 1, and from 3 to 3.30 p. m.

For signals governing the opening and closing of this bridge see page 416.

**Santa Anna Harbor Lights.**—A red light buoy showing a flashing white light, visible 5 miles, is moored on the eastern side of the entrance.

An occulting white light, visible 14 miles, is shown from a radio tower 80 feet (24.4 m.) above high water on the western side of the harbor entrance.

A fixed red light, 26 feet (7.9 m.) above high water, is shown from a wooden frame tower 25 feet (7.6 m.) high on the western side of the harbor entrance. This light locates the position of a cable landing on this side of the harbor.

A fixed green light, 22 feet (6.7 m.) above high water and visible 4 miles, is shown from an iron frame tower 20 feet (6.1 m.) high on the eastern side of the harbor entrance. This light locates the position of a cable landing on the eastern side of the harbor.

A fixed red light, 25 feet (7.6 m.) above high water, visible 4 miles, is shown from wooden crossbeams 14 feet (4.3 m.) high on the western side of the entrance to the Schottegat. This light is only shown when vessels enter or leave the Schottegat.

A fixed green light, 15 feet (4.6 m.) above high water, visible 4 miles, is shown from wooden crossbeams 14 feet (4.3 m.) high on the eastern side of the entrance to the Schottegat. This light is only shown when vessels enter or leave the Schottegat.

**Buoys.**—A black barrel buoy is moored about 150 yards eastward of Juliana Wharf.

A mooring buoy is moored about 300 yards 245° from the western end of the same wharf.

**Beacons.**—Beacons are erected at the entrance to Asiento, Boeska, and Versali Bays.

**Anchorage.**—Anchorage may be found in the Schottegat, but vessels must leave a clear space for turning and for going alongside the docks of the petroleum company.

It is better for ships to go alongside one of the many docks.

**Harbor signals.**—The following signals are made for the benefit of shipping, entering, leaving, and at anchor in Santa Anna Bay and the Schottegat:

*Signal 1. Black ball, hoisted at half mast.*—Is shown as soon as a steamer or motor vessel indicates by means of three long blasts on the whistle that it is going to leave.

*Signal 2. Black ball, previously hoisted mastheaded.*—Indicates that a vessel leaving the Schottegat for the sea has approached Santa Anna Bay so closely that the bridge must be opened.

*Signal 3. Two red lanterns, placed vertically.*—Shown at night as soon as a vessel leaving the Schottegat indicates by three long blasts on the whistle that the bridge must be opened.

*Signal 4. Black cone.*—Indicates that the bridge will be opened for a vessel off the entrance to the harbor.

*Signal 5. Two white lanterns placed vertically.*—Indicates, by night, that the bridge will be opened for a vessel off the entrance to the harbor.

*Signal 6. Green flag or green lantern.*—Indicates that the bridge has been opened for a vessel entering.

*Signal 7. Red flag or red lantern.*—Indicates that the bridge has been opened for a vessel which is leaving.

*Signal 8. Red and green flag or red and green lantern placed vertically.*—Indicates that the harbor is closed.

*Signal 9. Black cylinder.*—Indicates that a vessel is moving from West to East Schottegat.

*Signal 10. Black ball above a black cylinder.*—Indicates that a vessel is moving from East to West Schottegat.

*Signal 12. Black cone above a black ball.*—Indicates that a vessel is moving from Schottegat to Santa Anna Bay.

*Signal 12. Black cone above a black ball.*—Indicates that a vessel is moving from Santa Anna Bay to the Schottegat.

*Signal 13. Black cylinder above a black ball.*—Indicates that a vessel is moving in Santa Anna Bay.

*Signal 14. Red lantern above a white lantern.*—Indicates that a vessel is leaving.

*Signal 15. Black cone above a black cylinder.*—Indicates that the bridge will be closed.

*Signal 16. Two green flags, or, by night, two green lanterns, placed vertically.*—The bridge attendant on the bridge gives four blasts

on a steam whistle and keeps the bridge closed until the flags have been removed.

If the bridge is opened or is about to be opened only to be closed immediately, the pilot on a vessel entering or leaving will sound four blasts on the steam whistle or a foghorn as a countersignal to indicate that it is imperative that the bridge remain open or be opened.

With exception of signals 1, 2, and 3, which are shown only on Fort Nassau, the signals are shown from the Water Fort as well as from Fort Nassau.

*One green flag or a green light shown from the pilot office.*—Signal to indicate that the bridge attendant is to close the bridge.

*One red flag or a red light shown from the pilot office.*—Signal to indicate that the bridge attendant is to keep the bridge open.

The following signals are to be made by shipping while in the harbor:

When a steamer or motor vessel in the harbor is ready to change berth and the signals on the signal masts indicate that the channel is clear, it will hoist a black ball at the foremast head, and at the same time sound a long blast as an attention signal.

A vessel that is ready to moor after it has entered or is changing berth sounds one long and three short blasts. The vessel which has changed berth will also haul down the ball.

Even before the entering vessel or the vessel changing berth has been moored if the entrance to the harbor is clear, the vessel will sound the signal one long and three short blasts and at the same time haul down the ball.

**Storm signals.**—Storm and hurricane warning signals are shown at the most southern radio pole at the Rif Fort, western side of the entrance to the Port of Willemstad, Island of Curaçao.

If a storm is expected at Curaçao, or in the vicinity, a square red flag with a black square in the center will be shown during the daytime.

If a hurricane is expected at Curaçao, or in the vicinity, two storm signals (as above) will be shown, one above the other, during the daytime, and at night three vertical lights, white, red, white, will be shown.

As hurricanes in the Caribbean Sea generally move north of Curaçao, a green pennant will be shown under the hurricane signal when a hurricane is expected between 60° and 65° west longitude in the Caribbean Sea, and a black pennant will be shown under the hurricane signal when a hurricane is expected between 65° and 70° west longitude.

The Meteorological Service will publish weather reports when there is a hurricane in the Caribbean Sea.

**Signal Station.**—The signal station on Fort Nassau repeats all signals from the water-front signal station for the benefit of ships in the Schottegat.

**Current.**—Outside the harbor entrance there is usually a westerly current, but it presents no difficulty, as the great majority of the time it has a velocity of less than 1 knot. At rare intervals, there is a slight easterly current.

**Pilots.**—Pilotage is compulsory for all vessels except colonial vessels of 20 tons (gross) and under, and naval vessels. Pilots will be provided for these if required. The Government does not hold itself responsible for any act or neglect of the pilotage staff. Pilots usually board vessels about 1 mile off the entrance to the harbor, and are available at all times; vessels may enter night or day.

By day, vessels requiring a pilot shall hoist the customary international pilot signal; by night hoist a white light above a red light and also show a flashing light.

A brightly lighted P placed on the south side of the Water Fort and visible to seaward is shown when a vessel off the entrance requests a pilot, to indicate that a pilot will be sent out.

**Directions.**—If intending to enter Santa Anna Bay it is necessary to guard against the effects of the wind and current even when some distance off the harbor entrance and to keep to the northward of the range, green Santa Anna Harbor entrance light, and the light buoy.

After passing the light buoy, it is necessary to reduce speed in passing through the bridge.

When anchoring in the Schottegat, the southeastern part is considered the more desirable location.

**Sailing vessels.**—In entering Santa Anna Harbor a sailing vessel should pass close westward of the light buoy marking the shoal from Fort Amsterdam, as in consequence of the prevailing westerly set there is danger of being set on the shoal extending from Fort Rif, the opposite point.

With the wind strong from the northeast, it will rush off through the entrance channel in baffling gusts; therefore hawsers should be at hand to run out to the dolphins placed on either side of the channel for this purpose. From abreast the buoy, the yards must be braced sharp up, and everything ready to clew up and anchor immediately should the sails be taken aback to prevent drifting on the lee shore, which is foul in places. The moment a crane situated on an elevated spot is seen to open out westward of Fort Amsterdam, luff boldly, and when the vessel's way is lost anchor or run out warps.

With the wind from the southeastward there is no difficulty, as a vessel will sail through the channel into the harbor, and the middle of the entrance may be taken from a wide offing as soon as the channel is fairly open; it is to be observed, however, that a strong westerly current generally runs close to the shore.

Vessels may not enter at night.

**Regulations.**—The regulations of the port are similar to those of an up-to-date port, and a copy of them may be obtained from the harbor master.

**WILLEMSTAD** ( $12^{\circ} 06' N.$ ,  $68^{\circ} 56' W.$ ; *H. O. Chart 1049*), the principal town of Curacao, is situated just within Fort Amsterdam, on the eastern side of entrance to Santa Anna Harbor. It is connected with Scharlo, its suburb, by a bridge across the entrance to the Waigat, an inlet about  $\frac{1}{2}$  mile in length.

The town has a very picturesque appearance from seaward. It is clean and has varied styles of red-roofed, yellow, and white-washed houses. The town is lighted by electricity and has naphtha-propelled tramways.

On the opposite side of the entrance to Santa Anna Bay is the town of Otrabanda, connected to Willemstad by the pontoon bridge before mentioned.

The United States is represented by a consul.

**Wharves.**—There are 13 wharves in the harbor, of which 9 are on both sides of the Santa Anna Bay and 4 are in the Schottegat. All wharves, except the Wilhelmina, will take vessels of 26 foot (7.9 m.) draft. The Wilhelmina will accommodate vessels with a draft of 20 feet (6.1 m.).

All wharves are equipped with storehouses for cargo.

There are no cranes capable of heavy lifts. Ship's winches are used to load and unload all cargo.

The port has about 30 lighters, the great majority of which are uncovered.

**Tugs.**—There is one tug for harbor service. A wrecking tug, which is usually stationed at Aruba, can be obtained if its services are necessary.

**Dry dock.**—There is a dry dock at Willemstad, whose length over all is 325 feet; length on the bottom is 287 feet; breadth at entrance is 58.6 feet. The dock has a lifting power of 3,000 tons and can take vessels whose draft is not greater than 12 feet (3.7 m.). This dock is owned by the Curacaoshe Petroleum Co., but in cases of emergency other ships can obtain its use. (See Appendix II.)

**Supplies.**—Ships chandler supplies can be obtained in almost any quantity, but engineering stores are scarce. Fresh commissary supplies are scarce but there is a cold-storage plant which maintains a stock of cold-storage provisions.

**Water** will be delivered alongside if at anchor in the stream or by pipe line if secured to the dock.

**Coal.**—About 15,000 tons is usually in stock, of which the bulk is American. It is kept in well-built stores on the western side of entrance to the Schottegat.

There are three coal wharves, named the DeWilde, Nieuwe, and Juliana; all located in the Schottegat. Vessels can go alongside the wharves, where there are good facilities for bunkering. It is usual for naval vessels to coal from lighters. Coal can be put on board at an average rate of 120 tons per hour. If coaling in the stream, the rate of delivery is 100 tons per hour. The wharves are lighted by electricity, and vessels may have a telephone provided free of charge. One of the firms owns a tug which tows lighters free of charge. There is no interruption from weather.

**Fuel oil.**—An unlimited quantity of all petroleum products such as bunker oil Diesel oil and gasoline is maintained on hand. Vessels go alongside the company's oil dock at either Caracas Bay or the Schottegat, and the oil is pumped aboard.

**Communication.**—Steamers of the Dutch West India Mail, Italian Società National, Spanish Transatlantic, and American Red D Line call here.

Telegraph cables connect the island with Santo Domingo, La Guaira, and Vela de Coro.

Mails arrive weekly.

**Radio station.**—There is a radio station at the western side of the entrance to Santa Anna Bay. Call letters PJC. (See International List of Radio Stations.)

**Time signal.**—A red pennant is hoisted on a staff at Fort Nassau at 11h. 55m. a. m. and hauled down quickly on the firing of a gun on board the guardship at 0h. 0m., local civil time, corresponding to 4h. 35m. 47.6s., Greenwich civil time.

A red flag is also dropped from the radio station at the same time.

These signals are not sufficiently accurate to rate chronometers.

The sanitary conditions of Willemstad are considered good.

**Hospitals.**—There are three hospitals, any one of which will accept seamen provided applicants have orders from local physicians.

**Westpoint Bay.**—This anchorage is situated southward of the northwestern extremity of Curaçao Island. A bank of 5 fathoms (9.1 m.) extends nearly from the northern to the southern point of the bay, inside of which a general depth of 10 or 12 fathoms (18.3 to 21.9 m.) will be found, affording good and secure anchorage. Seaward of this 5-fathom (9.1 m.) bank the average depth is 12 to 15 fathoms (21.9 to 24.7 m.), extending about  $\frac{1}{2}$  mile offshore, where the soundings terminate abruptly.

**North Point Light,** group flashing white, 136 feet (41.5 m.) above high water, visible 14 miles, is shown from a white masonry structure, 20 feet (6.1 m.) high located on North Point.

**Coast.**—The east coast of Curaçao extends in a southeasterly direction  $31\frac{1}{2}$  miles to Canon Point. The coast is steep-to and can be approached safely, remembering that it is a lee shore.

South of Sabaneta Point, the coast recedes about  $3\frac{1}{2}$  miles, forming an exposed bay which affords no shelter.

**ARUBA** ( $12^{\circ} 30' N.$ ,  $69^{\circ} 58' W.$ ; *H. O. Chart 5520*) lies 42 miles westward from Curaçao. It is  $16\frac{1}{2}$  miles in length in a northwest and southeast direction, by about  $4\frac{1}{2}$  miles in breadth; the extremities are level and very low, but in the middle it is of moderate height.

Pan de Azucar (Sugar Loaf Hill) or Hooiberg, so named from its shape, 541 feet (164.9 m.) in height, is visible in clear weather from a distance of 18 to 20 miles, and when first sighted the land toward the western end appears in broken hummocks.

Jamanota, 617 feet (188.0 m.) in height, is about 4 miles south-eastward from Hooiberg.

The southwest coast of the island as far as Oranjestad is skirted by a chain of low sandy cays, off which there is deep water. The northeast is rocky and is in many places undermined by the action of the sea and should not be approached from seaward. (See view 30, Appendix V.)

Due to lack of water, the island is not fertile.

The population of the island in 1926 was about 9,200.

**North Point** ( $12^{\circ} 37' N.$ ,  $70^{\circ} 03' W.$ ) is the northwestern point of the Aruba and is the end of a plateau which falls abruptly to the sea.

**North Point Light**, group flashing white, 180 feet (54.9 m.) above high water, visible 14 miles, is shown from a gray stone tower 98 feet (29.9 m.) high. (See Light List.)

**West Point** (*plan on H. O. Chart 2154*).—From North Point the coast of the island curves gradually a distance of about 5 miles to West Point. The coast is fringed with a reef of  $1\frac{1}{2}$  fathoms (2.7 m.) for 1,200 yards offshore.

**Landmark**.—A large aluminum water tank makes a good landmark.

**Anchorage**.—There is anchorage off the island in the center of the bight about 1 mile offshore, with Pan de Azucar bearing about  $133^{\circ}$  and North Point Light bearing  $16^{\circ}$ . Here a vessel will find good shelter on a white bank in about 7 fathoms (12.8 m.), but care must be taken to pick out a clear spot, as some parts are rocky.

There is also anchorage in about 8 fathoms (14.6 m.) 600 yards south-southwestward from Sand Point, which has a house on it.

**Pier**.—A wharf about 1,700 feet long, in the shape of an F, is being constructed at West Point. This is to be used in connection with an oil refinery being built at this point by the Eagle Oil Co. This installation will consist of about 62 tanks.

**Caution**.—When approaching at night this point can easily be mistaken for Oranjestad, as the lights on this pier are brighter than those of Oranjestad.

**Paarden Bay** ( $12^{\circ} 31' N.$ ,  $70^{\circ} 03' W.$ ; *plan on H. O. Chart 2154*) is a narrow anchorage, protected from the westward by a reef of coral and stones about 1 mile in length, northwest and southeast, and about 200 yards in breadth; near the center of the reef there are three small islets.

The entrance to the anchorage, 100 yards in width, between shoals on either side, is at the southern end of the reef. (See view 16, Appendix V.)

**Depths**.—The average depth in the anchorage is 5 to 6 fathoms (9.1 to 11.0 m.), but the entrance only carries  $3\frac{1}{4}$  to  $3\frac{1}{2}$  fathoms (5.9 to 6.4 m.), with one patch of 17 feet (5.2 m.) near the northwestern reef at the entrance.

**Oranjestad Light**, fixed white, 61 feet (18.6 m.) above high water, visible 6 miles, is shown from a stone square tower, 57 feet (17.4 m.) high. The upper third of this tower is painted white, middle third red, and the bottom third blue. It is difficult to distinguish this light from the lights of the towns.



**Buoys and beacons.**—The southern entrance channel and Paarden Bay are buoyed as follows:

Starboard side on entering: Two red can buoys; beacon with a cylindrical top mark and 2 white spar buoys without top marks.

Port side on entering: One small red buoy.

**Anchorage.**—The best anchorage while awaiting a pilot is outside the southern channel near the entrance buoy, with the northern church in range with a point midway between the light and the southern church, but care should be observed in strong winds.

Inside the reef, anchorage may be taken any place the draft of the vessel permits where there is sufficient swinging room or alongside the wharf, in the northern part of the bay, where there is a depth alongside of 14 feet (5.8 m.).

**Currents.**—There is practically no tide in the bay. Outside, the current has a general westerly set, but its velocity has not been definitely determined; but it is reported that at times it attains a velocity of 4 knots.

**Winds.**—Strong easterly winds prevail in this vicinity almost the entire year.

**Pilots.**—Pilotage for Paarden Bay is compulsory. Pilot will board vessel about 1 mile outside the southern entrance, but his arrival is sometimes delayed and vessels must wait for him.

**Directions.**—Vessels approaching Oranjestad, when in the vicinity of Aruba, in the late afternoon, or at night, should lie-to, at about 15 miles to the west of Curaçao, so as not to drift by Aruba. At daylight run down under short sail to about 4 miles southeast of Oranjestad Light and about 2 miles offshore, then lie-to and wait for the pilot. He will come off in a boat flying the Dutch flag.

Sailing vessels approaching Oranjestad should get close in with the cays as far to windward as Sugar Loaf before running down, on account of the strong westerly current. From the opening to the harbor the Sugar Loaf bears about 80°.

Vessels should be careful to keep on the range in entering, as the water shoals suddenly on both sides. This range bears 28°, and consists of a large red house in range with a small black house on the shore. The buoy southward of the light is on the range.

**Caution.**—It has been reported that the chart of Paarden Bay is incorrect and mariners are therefore warned to observe care in its use until such time as it can be reissued.

**ORANJESTAD** (12° 31' N., 70° 02' W.), the principal settlement on Aruba, and the seat of the government of that island, lies on the eastern side of Paarden Bay.

**Wharf.**—There is one wharf, the property of the Eagle Oil Co., which has a depth of 19 feet (5.9 m.) alongside.

Cargo is handled by open lighters landing the cargo at a small wharf near the light.

All cargo must be loaded and unloaded by ship's equipment.

**Supplies.**—No supplies are obtainable.

**Communications.**—There is steamer connection with Curaçao and by means of oil tankers with the remainder of the world.

**Radio station.**—There is a radio station at Aruba Island; call letters PJA. This station is open to the public. (See International List of Radio Stations.)

**Coast—Barrier Reef.**—From the entrance to Paarden Bay the west coast of Aruba extends in a general southeasterly direction for about 10 miles to St. Nicholas. Along this entire section of the coast there is a barrier reef which extends offshore about 700 yards, with deep water close to it.

This reef is broken in places, permitting vessels to enter the lagoon. The principal entrance points other than Paarden Bay are Spanish Lagoon,  $4\frac{1}{2}$  miles southeastward, and Kommandeur's Bay,  $6\frac{3}{4}$  miles southward of Paarden Bay.

**ST. NICHOLAS BAY** ( $12^{\circ} 25' N.$ ,  $69^{\circ} 54' W.$ ), about 3 miles westward of Punta Colorado, is a harbor  $\frac{3}{4}$  mile long and  $\frac{1}{4}$  mile wide, which has been constructed by the Lago Oil & Transport Co. It affords shelter from the prevailing winds.

**Depths.**—The entrance through the reef and the bay inside have been dredged to a least depth of 32 feet (9.8 m.); outside, deep water extends to the entrance.

**Landmarks.**—Upon approaching from the westward, a large black water tank with the word "Lago" in white letters is the most conspicuous object. Other prominent landmarks marking the bay are the oil tanks and a conspicuous white house with a flagstaff.

**Lights.**—A flashing green light, visible 7 miles, is shown from a white beacon located on the northwestern end of the reef on the outer eastern side of the entrance.

A flashing green light, visible 1 mile, is shown from a small white beacon located about 500 yards  $326^{\circ}$  from the light on the outer reef on the inner east side of the entrance channel.

A flashing red light, visible 1 mile, is shown from a small white beacon on the inner west side of the entrance channel.

**Range lights.**—Two fixed green lights shown from white beacons, in range bearing  $325^{\circ}$ , lead through the entrance in a least depth of 32 feet (9.8 m.).

**Light buoy.**—A gas light buoy, showing a flashing red light, is moored in 24 feet (8.2 m.) of water off the western entrance to the channel to St. Nicholas Bay.

**Buoys.**—There are eight can buoys moored in the northwestern part of the bay. They mark the 13-foot (4.0 m.) curve.

**Anchorage.**—Vessels do not as a rule anchor in St. Nicholas Bay because of blocking the fairway but sometimes moor to mooring

buoys provided for that purpose and can not anchor outside the reef, so if there is no space alongside the wharf available it is better to wait at Oranjestad until berthing space is available.

**Wharves.**—There is a T-shaped concrete wharf, whose outer face is parallel to the entrance range and is 1,000 feet long, with a least depth of 32 feet (9.8 m.) alongside. On the inner face are two berths which have depths alongside 20 feet (6.1 m.) on the north-western side and 22 feet (6.7 m.) on the southeastern side. It is to the outer face of this wharf that ocean-going vessels secure. There is a dolphin about 75 feet off each end of the pier.

In addition there are two piers in the southeastern part of the bay with depths alongside of 16 feet (4.9 m.).

**Current.**—A strong northwesterly current runs off the entrance to the bay.

**Wind.**—The customary strong northeast trade winds blow here for 10 months a year.

**Pilot.**—Pilotage is compulsory, and pilot will board ship about  $\frac{1}{2}$  mile off the mouth of the channel.

Pilot will not bring ship into port and dock her after dark.

The signal for a pilot is the customary international signal.

**Tug.**—There is one large tug stationed at St. Nicholas Bay to assist vessels in berthing. The use of this tug is necessary because of the strong winds which tend to blow a vessel away from the dock.

**Directions.**—There is no difficulty in approaching the entrance to the bay, but every effort should be made to arrive in sufficient time to be berthed before dark, as otherwise vessels will have to lie off the entrance or anchor off Oranjestad until daylight.

If necessary to lie off to await daylight or the pilot, cognizance should be taken of a strong northwesterly current off the entrance and precautions taken accordingly.

Vessels should keep ballast on board to facilitate docking. It can then be pumped overboard.

**SAN NICHOLAS BAY** ( $12^{\circ} 25' N.$ ,  $69^{\circ} 54' W.$ ) is the site of a large petroleum refinery, and as such is visited by a great number of Lake Maracaibo and ocean-going oil tankers.

**Marine railway.**—A marine railway about 625 feet long, with 16 feet (4.9 m.) draft and a lifting power of between 500 and 1,000 tons, has been constructed in the northwestern part of the bay for the use of the company's lake tankers.

**Repairs.**—Minor repairs can be made.

**Supplies.**—Practically all types of commissary stores can be obtained in reasonable quantities.

**Fuel oil.**—All petroleum products, such as bunker and Diesel oil and gasoline, can be obtained in unlimited quantities.

**Water** is very scarce.

**Hospital.**—The company maintains a hospital here.

**Quarantine regulations.**—The health authorities board all incoming vessels after they have secured to the wharf.

**Punta Colorado.**—From St. Nicholas Bay the coast of the island trends eastward to Punta Colorado, which is the southeastern point of the island and which drops sharply offshore.

**Punta Colorado Light**, a flashing white light, 167 feet (50.9 m.) above high water, is shown from a square gray stone tower 29.5 feet (10.0 m.) high on Punta Colorado.

**Coast.**—The northeast coast of Aruba trends in a northwesterly direction 16½ miles from Punta Colorado to North Point. It is bold and steep-to and may be safely approached, bearing in mind that it is a lee shore.



## APPENDIX I

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The following is reproduced for the information of mariners:

### CAUTION WHEN APPROACHING BRITISH PORTS

#### PART I.—CLOSING OF PORTS

1. My Lords Commissioners of the Admiralty having taken into consideration the fact that it may be necessary to forbid all entrance to certain ports of the Empire, this is to give notice that on approaching the shores of the United Kingdom, or any of the ports or localities of the British Empire, a sharp lookout should be kept for the signals described in the following paragraph, and for the vessels mentioned in paragraph 5, Part II, of this notice, and the distinguishing and other signals made by them. In the event of such signals being displayed, the port or locality should be approached with great caution, as it may be apprehended that obstructions may exist.

2. If entrance to a port is prohibited, three red vertical lights by night or three red vertical balls by day will be exhibited in some conspicuous position in or near to its approach, which signals will also be shown by the vessels indicated in paragraph 5, Part II, of this notice.

If these signals are displayed, vessels must approach the port with the greatest caution, and implicitly obey all orders or signals given them by the examination vessel or signal station.

3. At some ports or localities at home or abroad, searchlights are occasionally exhibited for exercise. Instructions have been given to avoid directing movable searchlights during practice onto vessels under way, but mariners are warned that great care should be taken to keep a sharp lookout for the signals indicated in paragraph 2 above, when searchlights are observed to be working.

#### PART II.—EXAMINATION SERVICE

4. Under certain circumstances, it is also necessary to take special measures to examine vessels desiring to enter the ports or localities at home or abroad.

5. In such case vessels carrying the distinguishing flags or lights mentioned in paragraph 7 will be charged with the duty of examining ships which desire to enter the ports and of allotting positions in which they shall anchor. If Government vessels, or vessels belonging to the local port authority, are found patrolling in the offing, merchant vessels are advised to communicate with such vessels with a view to obtaining information as to the course on which they should approach the port. Such communication will not be necessary in cases where the pilot on board has already received this information from the local authorities.

6. As the institution of the examination service at any port will never be publicly advertised, especial care should be taken in approaching the ports, by day or night, to keep a sharp lookout for any vessel carrying the flags or lights

mentioned in paragraph 7 and to be ready to "bring to" at once when hailed by her or warned by the firing of a gun or sound rocket.

In approaching by night any British port in the United Kingdom, or abroad, serious delay and risk will be avoided if four efficient all-round lanterns, two red and two white, are kept available for use.

7. By day the distinguishing flag of the examination steamer will be a special flag (white and red horizontal surrounded by a blue border).

Also, three red vertical balls if the port is closed.

Usually the examination steamers will fly the blue ensign, but at certain ports they will fly the white ensign.

By night the steamer will carry: (a) Three red vertical lights if the port is closed; (b) three white vertical lights if the port is open.

The above lights will be carried in addition to the ordinary navigation lights, and will show an unbroken light around the horizon.

8. Masters are warned that, when approaching a British port where the examination service is in force, they must have the signal letters of their vessel ready to hoist immediately the examination steamer makes the signal: "What ship is that?"

9. Masters are warned that, before attempting to enter any of these ports when the examination service is in force, they must in their own interests strictly obey all instructions as to entry given to them by the examination steamer.

Whilst at anchor in the examination anchorage, masters are warned that it is forbidden, except for the purpose of avoiding accident, to do any of the following things, without permission from the examination officer: (a) To lower any boat; (b) to communicate with the shore or other ships; (c) to move the ship; (d) to work cable; (e) to allow any person or thing to leave the ship.

10. In case of fog, masters of vessels are enjoined to use the utmost care, and the port should be approached with caution.

11. When the examination service is in force, merchant vessels when approaching ports are especially cautioned against making use of private signals of any description, either by day or night; the use of them will render a vessel liable to be fired on.

12. The pilots attached to the ports will be acquainted with the regulations to be followed.

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The following French regulations are reproduced for the information of mariners:

#### REGULATIONS FOR APPROACHING FRENCH TERRITORIAL WATERS IN TIME OF WAR

1. In time of war the visits of ships, other than French naval vessels, to anchorages and ports on the French littoral or in French protectorates are governed by the regulations given below.

2. No French merchant vessel nor foreign vessel, either naval or merchant, may approach within 3 miles of the coast in French territorial waters or of French protectorates without permission without running the risk of being destroyed.

3. Every vessel affected by the present decree must hoist her national flag on approaching the prohibited zones, and also her International Code number; at night, she must show her navigation lights.

If desirous of entering the prohibited zone in order to reach a port, permission must be asked as follows:

By day, by hoisting the pilot flag (S flag of International Code).

By night, by making the visual signal P T (a pilot is required), followed by her International Code number, or, if she has no means of doing this, by making the night signal for a pilot in accordance with the International Code, viz., a white light flashed or shown just above the bulwarks at short or frequent intervals for about a minute at a time, accompanied if necessary by blue light every 15 minutes.

The vessel must remain outside the zone until she has received a reply by semaphore or from an examination vessel.

The reply by semaphore or from the examination vessel is made as follows:

Entry permitted: By day, by searchlight, letter S repeated three times, or letter S by flag signal. By night, by searchlight or flashing light, letter S repeated three times, or by Very's light, red-green.

Entry forbidden: By day, by searchlight, letter D repeated three times. By night, by searchlight or flashing light, letter D repeated three times, or by Very's light, red only.

If permission is granted, the vessel must enter the prohibited zone at reduced speed, showing by day the pilot flag and by night her navigation lights, and must steer for the examination vessel. The latter has normally no distinguishing marks, but if she wishes to show vessels in sight that she is engaged on examination duties she shows at the masthead a black ball by day and a red light at night.

If entry be refused, the visiting vessel must leave for some other anchorage.

Article 4 relates to certain prohibited zones of which are in the area included in this volume.

5. In foggy weather every vessel affected by the present decree desirous of entering the forbidden zone is to hoist the same signals as in clear weather and blow blasts on the whistle or siren until permission to enter has been given by an examination vessel.

6. Every vessel affected by the present decree must immediately comply with the orders of a war vessel or examination vessel, semaphore or signal station, given by voice, International Signal Code, or by warning gun.

Any vessel challenged by a battery or vessel of war must immediately alter course by more than eight points ( $90^\circ$ ) and steer so that she remains in sight of signals from the vessel of war or semaphore station nearest to the battery that challenged her. She may not proceed on her former course until authorized to do so.

If the vessel does not alter course after a blank charge has been fired to warn her, a live shell will be fired a few minutes later, and if a vessel does not immediately conform to this order, effective fire will be opened on her.

In cases of emergency the blank charge may be omitted.

At night the warning gun may also be omitted, and every ship entering the forbidden zone without permission is liable to be destroyed without preliminary warning.

7. Vessels authorised to enter roads and ports in France, or in the French colonies or mandatory territories, must keep strictly within the approach channel.

For this purpose they will be piloted by a vessel set apart for this duty. Should a port have no pilotage vessel, the examination vessel will send a pilot on board the visiting vessel.



Vessels must take up the berths assigned to them and conform strictly to the special regulations in force.

The length of stay of a ship will depend on military considerations, and when circumstances require it a ship may be ordered to put to sea or to move to a determined point; such order must be carried out without delay, though respite may be allowed to ships really unable to conform to it immediately.

No vessel is to get under way, either to change berth or to quit the roads, without the permission of the local authority; a request may be made by signal, S flag.

8. In naval roads and ports, between sunset and sunrise, the movement of boats, other than those of French war vessels, is absolutely forbidden.

From sunrise to sunset movement is only allowed to boats which have received a special permit from the naval authorities and the means of making themselves recognizable.

Boats with permits should steer clear of naval vessels if ordered to do so and can not in any case go alongside the latter without their permission. The movement of these boats will moreover remain subject to local regulations, notably those relative to the prohibition to enter certain parts of the roadstead and to go alongside at any other place than those expressly notified.

In commercial ports similar measures will be taken by the local authority to impose the restrictions judged necessary on the movement of boats, due consideration being given to the interests of commerce.

9. Visits by neutral naval vessels are governed by the regulations in time of peace, so far as notification or previous authorization is concerned, the regulations for entry being governed by the present decree.

10. The measures provided for by the present decree are to come into force on mobilization or on special notice.

11. Any infraction of the present decree will lead to such repressive measures as circumstances admit of, in addition to the risks of destruction incurred.

**Signals when access is forbidden.**—Access to French ports may be forbidden or subjected to certain regulations on account of naval maneuvers, exercises, or for any other cause.

Under these circumstances—

1. A warning signal will be made from a conspicuous point, consisting of three balls, one above the other, by day, and three red lights, one above the other, by night.

2. The same signal will be shown from the watch vessel.

3. Any vessel wishing to go into or out of French waters when one of the above signals is made should, by day, hoist the pilot flag, and await the arrival of the watch vessel; by night, burn one or more Bengal lights, accompanied by the whistle or siren, and await the arrival of the watch vessel.

4. At the challenge or a warning shot from the watch vessel every vessel must stop or heave to.

5. Vessels, in this case, will be subject to a visit by the watch vessel, which will give them instructions as follows:

(a) If a special examination service is established, where it will be found.

(b) If the entrance to the port is closed, and for how long.

(c) If any special instructions exist for the navigation of a fixed region.

6. For vessels leaving the port the required instructions will be given in the port by the maritime authorities.

7. Vessels which will disobey the above instructions will do so at their own risk and peril, and will be obliged to make good any damage they are the cause of.

## APPENDIX II

*Particulars of dry docks, marine railways, etc.*

Port	Dock	Length		Breadth of en- trance	Depth at mean high water, springs		Spring range	Lifting power	Remarks
		On blocks	Over all		Over sill	On block			
		<i>Ft.</i>	<i>Ft.</i>	<i>Ft. Ins.</i>	<i>Ft.</i>	<i>Ft.</i>	<i>Ft.</i>	<i>Tons</i>	
Aruba.....	St. Nicholas Bay.....	.....	240.0	46 0	12.0 (3.7 m.)	.....	3.1 (0.9 m.)	1,200	Marine railway.
Barbados.....	Central Foundry Co.....	325	287.5	58 6	.....	12.0 (3.7 m.)	.....	3,000	Private dock for use of vessels of owner.
Curacao.....	Queen Wilhelmina Floating Dock, Willemstad.....	.....	383.7	91 8	23.4 (9.0 m.)	27.8 (8.5 m.)	1.4 (0.4 m.)	.....	.....
Martinique.....	Fort de France.....	419.9	.....	70 0	.....	.....	0.8 (0.2 m.)	3,000	Sunk and out of commission, Decem- ber, 1928.
St. Thomas, Virgin Islands.....	Government.....	250	.....	.....	.....	.....	.....	.....	.....
Trinidad, Port of Spain.....	Chaguaramas Bay.....	365	.....	65 0	18.0 (5.5 m.)	.....	4.0 (1.2 m.)	4,000	Patent slip, fit only for small vessels.
Venezuela, Maracaibo.....	.....	500	.....	136 0	.....	.....	2.5 (0.8 m.)	.....	In five sections. The dock is operated from land by electricity.
Puerto Cabello.....	Steel floating dock.....	282	.....	90 0	22 (6.7 m.)	.....	.....	2,400	.....

## APPENDIX III

*List of principal ports, showing particulars of depth, etc.*

Port	Depth (referred to datum of chart)		Spring range of tides	Remarks
	In channel of approach	In anchorage		
Antigua: St. Johns.....	5½ to 8 fathoms (10.5 to 14.6 m.).	6 fathoms (11.0 m.).	<i>Feet</i> 1.6 (0.5 m.)..	Greater drafts than 16 feet should anchor in outer roads.
Aruba: St. Nicholas Bay.	32 feet (9.6 m.).....	32 feet (9.6 m.).....		32 feet alongside wharf.
Barbados: Bridgetown....	Deep.....	4½ to 18 fathoms (8.2 to 32.9 m.).	3.1 (0.9 m.)..	
Curaçao:				
Caracas Bay.....	do.....	20 fathoms (36.6 m.).		3 piers with deep water alongside.
Willemstad.....	8 fathoms (14.6 m.)	7 to 10 fathoms (12.8 to 18.3 m.).		7 fathoms alongside wharf.
Dominica: Roseau.....	Deep.....	10 fathoms (18.3 m.).	1.6 (0.5 m.)..	Open roadstead.
Grenada: St. George.....	11 fathoms (20.1 m.).	4½ to 11 fathoms (8.2 to 20.1 m.).	1.5 (0.5 m.)..	18 to 20 feet alongside; dock in Carenage, depths of 20 to 25 feet.
Gaudaloupe:				
Basse Terre.....	Deep.....	5½ to 30 fathoms (10.1 to 54.9 m.).	1.1 (0.3 m.)..	Do.
Pointe a Pitre.....	4¾ fathoms (8.7 m.).	4 to 6 fathoms (7.3 to 11.0 m.).	1.1 (0.3 m.)..	21 feet alongside wharf.
Martinique: Fort de France.	Deep.....	5½ to 19 fathoms (8.2 to 34.7 m.).	1.5 (0.5 m.)..	24 feet alongside wharf.
Montserrat: Plymouth.....	do.....	10 to 20 fathoms (18.3 to 36.6 m.).		Open roadstead.
St. Christophor (St. Kitts): Basse Terre.....	do.....	5 to 10 fathoms (9.1 to 18.3 m.).		Do.
St. Lucia: Port Castries..	8¾ fathoms (15.9 m.).	7 to 9 fathoms (12.8 to 16.5 m.).	2.0 (0.6 m.)..	15 to 29 feet alongside wharf.
St. Vincent: Kingston....	Deep.....	17 fathoms (31.1 m.).	2.7 (0.8 m.)..	Open roadstead.
Trinidad:				
Port of Spain.....	do.....	3 to 6 fathoms (5.5 to 11.0 m.).	4.0 (1.2 m.)..	
San Fernando.....	10 fathoms (18.3 m.).	25 feet (7.6 m.).....	5.0 (1.5 m.)..	Piers with depth of 23 to 30 feet at Brighton and Pitch Point.
Venezuela:				
Carenero.....	4 to 5½ fathoms (7.3 to 10.1 m.).	3 to 4 fathoms (5.5 to 7.3 m.).	2.0 (0.6 m.)..	12 feet alongside railway pier.
Carupano.....	Deep.....	4 to 6 fathoms (7.3 to 11.0 m.).		12 to 14 feet alongside pier.
Ciudad Bolivar.....	11 to 14 feet (3.4 to 4.3 m.).	40 to 52 feet (12.2 to 15.8 m.).		No wharves; all boats land along river bank.
La Guaira.....	Deep.....	4 to 7 fathoms (7.3 to 12.8 m.).	2.8 (0.9 m.)..	31 to 33 feet alongside piers.
Las Piedras Bay.....	do.....	6 to 10 fathoms (11.0 to 18.3 m.).		30 feet alongside pier.
Maracaibo.....	11 feet (3.4 m.).....	25 to 40 feet (7.6 to 12.2 m.).	2.5 (0.8 m.)..	30 feet alongside wharf.
Puerta Cabello.....	5 to 11 fathoms (9.1 to 20.1 m.).	10 fathoms (18.3 m.).		26 feet along wharf.
Virgin Islands:				
Christiansted.....	6½ fathoms (11.9 m.).	17 feet (5.2 m.).....	0.8 (0.2 m.)..	
Frederiksted.....	Deep.....	4 to 30 fathoms (7.3 to 54.9 m.).		Open roadstead.
St. Thomas.....	36 feet (11.0 m.).....	22 to 30 feet (6.7 to 9.1 m.).	0.8 (0.2 m.)..	30 feet alongside docks.

## APPENDIX IV

## METEOROLOGICAL TABLES

[From the British Admiralty Sailing Directions]

*St. Johns, Antigua. Latitude 17° 05' N., longitude 61° 50' W. Height above mean sea level, 2½ feet (7.3 m.)*

[Meteorological table compiled from 16 to 53 years' observations]

Month	Barometer at 32° F., mean sea level, and latitude 45°				Air temperature										Rain				Wind										Number of days gales †	Number of days fogs ‡	
	Mean		Extreme		Mean			Extreme			Cloud amount, scale 0 to 10	Total fall	Number of days	Maximum fall in 24 hours	Mean force, Beaufort scale	Number of days from—															
	For month	Daily range	Maximum	Minimum	Range	Maximum	Minimum	Range	Maximum	Minimum						Range	North	Northeast	East	Southeast	South	Southwest	West	Northwest	Calm						
January	Ins.	Ins.	Ins.	Ins.	Ins.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	Ins.	20	Ins.	3.3	2.5	1	12	13	4	0	0	0	0	0	0	0	1		
February	30.00	0.38	30.18	29.80	0.38	76	82	71	11	88	61	27	69	3.3	2	Ins.	3.3	2.5	1	9	13	5	0	0	0	0	0	0	0	0	
March	30.03	0.44	30.24	29.80	0.44	76	82	70	12	89	60	29	67	3.2	1	5	3.2	2.5	1	11	13	4	0	0	0	0	0	0	0	0	
April	30.00	0.44	30.18	29.74	0.44	77	83	70	13	90	60	30	64	2.1	15	2.1	2.4	2.6	0	1	13	4	0	0	0	0	0	0	0	0	
May	29.98	0.41	30.15	29.74	0.41	78	84	71	13	93	60	33	65	6	15	6	7.1	2.6	0	8	13	7	1	0	0	0	0	0	0	0	
June	29.98	0.32	30.12	29.80	0.32	79	85	73	12	93	63	26	67	6	4	4.3	6.1	2.5	0	7	12	10	1	0	0	0	0	0	0	0	
July	30.00	0.32	30.15	29.83	0.32	80	86	74	12	93	63	25	68	6	17	2.5	2.5	2.9	0	9	14	7	0	0	0	0	0	0	0	0	
August	30.00	0.35	30.15	29.80	0.35	81	87	75	12	92	65	27	68	6	4	4.6	4.1	2.8	0	11	16	4	0	0	0	0	0	0	0	0	
September	29.98	0.35	30.12	29.84	0.35	81	87	75	12	92	69	25	69	6	18	6.9	5.0	2.7	0	10	15	6	0	0	0	0	0	0	0	0	
October	29.95	0.47	30.06	29.59	0.47	80	87	74	13	93	68	26	71	6	19	6.1	7.3	2.2	0	8	12	7	1	1	0	0	0	0	0	1	
November	29.92	0.38	30.09	29.71	0.38	79	85	73	12	92	65	27	72	6	19	5.1	5.1	2.1	0	7	13	8	1	1	0	0	0	0	0	1	
December	29.95	0.44	30.15	29.71	0.44	77	84	71	13	90	63	27	71	5	20	4.8	4.0	2.3	0	8	13	6	0	0	0	0	0	0	0	1	
Mean	29.98	0.07	---	---	---	79	85	73	12	---	---	---	---	6	20	4.8	5.0	2.5	3	110	162	74	5	4	1	1	5	---	---	---	
Total	---	---	30.24	29.35	0.89	---	---	---	---	---	---	---	---	---	---	---	7.3	---	---	---	---	---	---	---	---	---	---	---	---	---	
Extreme value	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Number of years observation.	40	---	26	---	---	29	---	---	---	---	---	---	---	28	25	53	29	28	16	26									---	---	

† Hurricane passed over the island, 1899. During the 26 years, 1893-1918, two gales were recorded, one in August and one in September, 1899.

‡ No fogs recorded during the 26 years 1893-1918.

Hours of observation—9 a. m., 3 p. m.

Authorities: Washington, D. C., United States Monthly Weather Review, 1901, pp. 165-173. Meteorological Register, kept at St. Johns, Antigua. Meteorological Observations, Antigua. (Extract Blue Books)

Montserrat. Latitude 16° 41' N., longitude 62° 09' W. Height above mean sea level 130 feet (39.6 m.)

(Meteorological table compiled from 4 years' observations. (Wind velocity from September 1916, only))

Month	Barometer at 32° F., mean sea level, and latitude 45°				Air temperature						Rain			Wind								Number of days gales	Number of days logs							
	Mean		Extreme		Mean			Extreme			Cloud amount, scale 0 to 10	Total fall	Number of days	Maximum fall in 24 hours	Mean velocity, miles per hour	Number of days from—														
	For month	Daily range	Maximum	Minimum	Range	Maximum	Minimum	Range	Maximum	Minimum						Range	North	Northeast	East	Southeast	South			Southwest	West	Northwest	Calm			
January.....	30.00	Ins.	30.09	29.77	Ins.	0.32	76	82	70	12	89	62	27	69	6	4.6	23	1.9	9.8	0	11	10	7	1	0	0	0	0	0	0.5
February.....	30.00	30.09	29.74	35	76	83	69	14	91	63	28	68	4	4.0	19	1.1	17	1.0	11.0	0	9	9	10	0	0	0	0	0	0	0.3
March.....	30.00	30.06	29.77	30	78	85	70	15	93	64	29	64	5	3.0	17	1.1	19	1.1	11.0	0	7	9	10	0	0	0	0	0	0	0.7
April.....	29.98	30.03	29.68	35	79	87	72	15	93	63	30	63	6	3.9	16	1.3	16	1.3	6.9	1	8	8	0	2	0	0	0	0	0	0.3
May.....	29.98	30.00	29.74	27	81	88	74	14	93	68	25	66	6	4.5	20	1.8	20	1.8	8.4	1	8	10	8	1	0	0	0	0	0	0.7
June.....	29.98	30.03	29.77	27	82	89	75	14	94	71	23	66	7	5.0	20	1.6	23	1.6	9.2	1	7	10	10	1	0	0	0	0	0	0.3
July.....	29.98	30.00	29.80	21	82	88	75	13	94	70	24	68	6	7.3	23	1.4	23	1.4	12.2	0	4	9	16	1	0	0	0	0	0	0.3
August.....	29.95	30.00	29.65	35	82	89	75	14	96	70	26	69	6	8.1	24	1.5	26	1.5	9.1	0	5	12	13	1	1	0	0	0	0	0.0
September.....	29.92	29.98	29.71	30	81	88	74	15	97	68	29	69	6	8.1	21	1.6	21	1.6	9.1	0	3	8	13	1	1	0	0	0	0	0.0
October.....	29.92	29.95	29.63	37	80	87	73	13	92	67	25	71	6	6.8	22	1.5	22	1.5	7.6	0	6	9	10	2	0	0	0	0	0	0.0
November.....	29.92	29.98	29.71	27	79	86	72	14	92	67	25	72	6	6.8	22	1.5	22	1.5	6.0	0	6	9	10	2	0	0	0	0	0	0.5
December.....	29.95	30.00	29.74	27	77	84	71	13	89	64	25	70	6	5.9	22	1.3	22	1.3	8.8	0	8	9	10	2	0	0	0	0	0	0.0
Mean.....	29.98	0.08	.....	.....	80	87	73	14	.....	.....	68	.....	.....	8.8	3	81	117	124	10	5	0	1	24	0	2.9	.....	.....	.....	.....	.....
Total.....	.....	.....	30.09	29.65	44	.....	.....	.....	97	62	35	.....	.....	69.0	249	7.6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Extreme values.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Number of years obsn.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

Hours of observation—9 a. m. 3 p. m.  
Authorities: Manuscript data at meteorological observatory.

## APPENDIX IV

Guadeloupe (Camp Jacob). Latitude 16° 01' N., longitude 61° 48' W. Height above mean sea level, 1,650 feet (502.9 m.)

[Meteorological table compiled from 9 to 19 years' observations, 1891 to 1912]

Month	Barometer at 32° F., mean sea level, and latitude 45°				Air temperature								Relative humidity				Cloud amount, scale 0 to 10				Rain				Wind								Number of days gales	Number of days fogs																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
	Mean		Extreme		Mean				Extreme				Range				Range				Range				Range				Range						Number of days from—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
					For month		Range		Minimum		Maximum																																Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum		Maximum		Minimum	

Observations reduced to mean of 24 hours.

Authorities: Annales du Bureau Central Meteorologique de France, 1901, Part I, Page 37. Annales du Bureau Central Meteorologique de France, Part II.

*Dominica (Roseau). Latitude 15° 21' N., longitude 61° 21' W. Height above mean sea level, 25 feet (7.6 m.)*

[Meteorological table compiled from 2 to 15 years' observations (1893-1907), for total rainfall (November, 1898-1901; July-November, 1902, 4, 5)\*]

Month	Barometer, at 32° F., mean sea level, latitude 45° mean of 24 hours				Air temperature				Relative humidity		Cloud amount, scale 0 to 10		Rain		Wind								Number of days gales <sup>1</sup>	Number of days fogs																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
	Mean		Extreme		Mean		Extreme		8 a. m.	8 p. m.	8 a. m.	8 p. m.	Total fall	Number of days	Maximum fall in 24 hours	Number of days from—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
	For month	Daily range	Maximum	Minimum	Range	For month	Maximum	Minimum								Range	North	Northeast	East	Southeast	South	Southwest			West	Northwest	Calm																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
January	29.98		30.12	29.86	0.27	77	84	71	13	88	67	21	69	%	76	4	3	4.5	17	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	

\* From 1901 reports were received only during the hurricane season, July to November.

<sup>1</sup> Report of rainfall at Dominica (Botanic Station).

<sup>2</sup> Height of aneroid, 47 feet (14.5m.).

<sup>3</sup> During the years 1898 (November-December) to 1902, 1 gale was recorded in August, 1899.

Hours of observation—8 a. m., 8 p. m.

Authorities: Washington, D. C., Report of Chief of Weather Bureau.

## APPENDIX IV

*Martinique (Fort de France). Latitude 14° 36' N., longitude 61° 05' W. Height above mean sea level, 13 feet (4.0 m.)*

[Meteorological table compiled from 20 to 22 years' observations, 1891-1912]

Month	Barometer at 32° F., mean sea level, and latitude 45°				Air temperature								Cloud amount, scale 0 to 10		Rain			Wind								Number of days gales <sup>1</sup>	Number of days logs
	Mean		Extreme		Mean				Extreme				Total fall	Number of days	Maximum fall in 24 hours	Mean fort scale	Number of days from—										
	For month	Daily range	Maximum	Minimum	Range	For month	Maximum	Minimum	Range	Maximum	Minimum	Range															
Ins.	29.95	Ins.	30.12	29.77	Ins.	0.35	76	83	69	14	90	6	19	2.7	1.7	9	8	7	2	0	0	1	3	1	—	0.6	
29.98	—	30.18	29.80	0.38	76	84	69	15	91	6	15	1.6	1.8	8	8	7	2	0	0	1	3	2	0	1	—	0.7	
March	29.95	—	30.12	29.74	0.38	77	85	69	16	91	6	15	2.4	1.7	7	7	8	3	1	0	0	0	1	2	2	—	0.4
April	29.95	—	30.12	29.80	0.32	79	86	71	15	94	6	17	4.4	1.6	7	6	10	4	1	0	0	0	1	2	2	—	0.1
May	29.95	—	30.09	29.80	0.30	80	87	73	14	93	6	17	4.4	1.6	7	6	10	4	1	0	0	0	1	2	2	—	0.0
June	29.95	—	30.15	29.80	0.35	80	86	74	12	92	6	17	4.4	1.6	7	6	10	4	1	0	0	0	1	2	2	—	0.0
July	29.98	—	30.21	29.80	0.41	80	86	74	12	92	6	17	4.4	1.6	7	6	10	4	1	0	0	0	1	2	2	—	0.0
August	29.95	—	30.12	29.74	0.38	81	87	74	13	94	6	22	4.3	1.7	6	8	11	3	1	0	0	0	2	2	2	—	1.1
September	29.92	—	30.06	29.71	0.35	81	88	74	13	94	6	22	4.3	1.7	6	8	11	3	1	0	0	0	2	2	2	—	1.1
October	29.89	—	30.03	29.71	0.35	80	87	73	14	94	6	20	4.2	1.4	7	7	9	3	1	0	1	0	1	2	3	—	0.5
November	29.89	—	30.03	29.68	0.35	79	86	72	14	92	6	19	4.8	1.3	8	6	6	4	1	0	1	0	1	2	3	—	1.5
December	29.92	—	30.09	29.74	0.35	77	84	71	13	89	6	19	3.6	1.6	9	7	6	4	0	0	1	0	1	2	2	—	1.1
Mean	29.95	0.09	—	—	—	79	86	72	14	—	6	—	—	1.6	90	87	96	36	5	0	6	24	21	—	2.6		
Total	—	—	30.21	29.68	0.53	—	—	—	—	96	6	221	6.4	—	—	—	—	—	—	—	—	—	—	—	—	—	
Extreme value	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Number of years' observation	40	—	—	—	—	22	—	—	—	—	21	—	—	20	—	—	—	—	—	—	—	—	—	—	—	20	

<sup>1</sup> During the 20 years 1891-1910 two gales were recorded, one in October, 1900, and one in March, 1902.

Hours of observation—6 a. m., 10 a. m., and 4 p. m.

Authority: Annales du Bureau Central Meteorologique de France, Part II.



*St. Lucia (Port Castries). Latitude 14° 01' N., longitude 61° 00' W. Height above mean sea level, 10 feet (3.0 m.)*

[Meteorological table compiled from 10 to 17 years' observations, 1898-1918]

Month	Barometer <sup>1</sup> at 32° F., mean sea level, and latitude 45°				Air temperature <sup>1</sup>												Cloud amount, scale 0 to 10	Rain <sup>1</sup>			Wind <sup>1</sup>								Number of days gales <sup>2</sup>	Number of days fogs <sup>2</sup>			
	Mean		Extreme		Mean				Extreme				Total fall	Number of days	Maximum fall in 24 hours	Mean force, Beaufort scale		Number of days from—															
	For month	Daily range	Maximum	Minimum	Range	Maximum	Minimum	Range	Maximum	Minimum	Range	North						Northeast	East	Southeast	South	Southwest	West	Northwest	Calm								
January	Ins.	Ins.	Ins.	Ins.	Ins.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	Ins.	21	3.2	Ins.	2.2	3	23	3	3	1	0	0	0	0	0	0	0	0	0	0	
February	29.95					76	82	69	13	57	30	76	5.3	18	4.2	2.3	2.3	3	20	4	4	1	0	0	0	0	0	0	0	0	0	0	
March	29.98					76	83	69	14	59	30	75	3.8	18	4.2	2.3	2.3	3	20	4	4	1	0	0	0	0	0	0	0	0	0	0	
April	29.96					79	84	69	15	90	59	31	3.8	18	4.2	2.3	2.3	3	20	4	4	1	0	0	0	0	0	0	0	0	0	0	
May	29.95					79	87	73	15	95	63	32	7.4	18	4.4	2.3	2.3	1	21	6	3	1	0	0	0	0	0	0	0	0	0	0	
June	29.95					80	88	73	15	97	67	30	7.4	18	4.4	2.3	2.3	1	19	7	3	1	0	0	0	0	0	0	0	0	0	0	
July	29.96					81	88	74	14	97	67	30	7.7	24	2.6	2.2	2.2	1	23	5	2	0	0	0	0	0	0	0	0	0	0	0	
August	29.95					81	87	74	13	94	68	28	7.9	23	2.6	2.2	2.2	0	24	4	2	0	0	0	0	0	0	0	0	0	0	0	
September	29.92					80	88	73	15	94	68	28	8.2	21	13.2	1.7	1.7	1	20	5	3	1	0	0	0	0	0	0	0	0	0	0	
October	29.89					79	87	72	15	91	66	25	8.2	21	13.2	1.8	1.8	1	20	5	3	1	0	0	0	0	0	0	0	0	0	0	
November	29.89					78	86	71	14	90	65	25	8.2	21	13.2	1.8	1.8	1	19	7	2	0	0	0	0	0	0	0	0	0	0	0	
December	29.92					77	83	70	13	89	61	28	8.1	23	4.6	2.1	2.1	1	26	2	1	0	0	0	0	0	0	0	0	0	0	0	
Mean	29.95	0.09				79	86	72	14							2.1	13	259	68	20	3	0	2	1	4	0	0	0	0	0	0	0	
Total													80.6	252	13.2																		
Extreme value.																																	
Number of years' observation	40																																

<sup>1</sup> From observations taken at 7 a. m. and 3 p. m. at the Botanic Gardens. <sup>2</sup> From observations taken at 8 a. m. by the harbor master.

Authorities: Meteorological Returns for the Botanic Station, St. Lucia. Meteorological Statistics, Castries, St. Lucia.

*Barbados. Latitude 13° 08' N., longitude 59° 36' W. Height above mean sea level, 181 feet (55.2 m.)*

[Meteorological table compiled from 6 to 23 years' observations, 1895-1917]

Month	Barometer, at 32° F., mean sea level, and latitude 45°				Air temperature						Relative humidity		Cloud amount, scale 0 to 10	Rain		Wind								Number of days gales <sup>1</sup>	Number of days logs		
	Mean		Extreme		Mean			Extreme			9 a. m.	3 p. m.		Total fall	Number of days	Maximum fall in 24 hours	Mean velocity, miles per hour <sup>1</sup>	Number of days from—									
	For month	Daily range	Maximum	Minimum	Range	Maximum	Minimum	Range	North	Northeast								East	Southeast	South	Southwest	West	Northwest			Calm	
January	Ins. 29.95	Ins. 30.09	Ins. 29.80	Ins. 30.30	°F. 76	°F. 83	°F. 70	°F. 13	°F. 86	°F. 61	°F. 25	°F. 66	Ins. 2.7	14	Ins. 2.1	11.2	0	11	17	3	0	0	0	0	0	0	0
February	29.95	30.12	29.80	32	76	83	69	14	87	61	26	68	7	7	1.6	12	0	8	15	4	1	0	0	0	0	0	0
March	29.95	30.09	29.74	35	77	84	70	14	88	62	26	67	7	7	2.1	11	2.0	0	8	18	5	0	0	0	0	0	0
April	29.95	30.09	29.74	37	78	85	71	14	90	64	26	66	7	8	1.9	11	1.8	0	5	17	6	1	0	0	0	0	0
May	29.95	30.09	29.77	32	80	87	73	14	90	66	24	66	7	8	2.5	11	1.2	0	4	19	8	1	0	0	0	0	0
June	29.95	30.09	29.80	30	80	87	74	13	89	67	22	67	7	8	1.9	11	1.7	0	7	19	5	1	0	0	0	0	0
July	29.95	30.09	29.83	31	80	86	74	12	89	69	21	72	7	8	6.9	18	1.6	0	7	17	4	1	0	0	0	0	0
August	29.92	30.09	29.83	31	80	86	74	12	89	67	23	72	7	8	6.9	18	1.6	0	5	15	5	2	1	0	0	0	0
September	29.92	30.09	29.41 <sup>a</sup>	32	79	86	73	13	89	68	21	73	7	8	6.3	17	4.7	0	5	15	8	2	1	0	0	0	0
October	29.91	30.03	29.71	32	79	85	73	12	89	67	22	73	7	7	7.3	17	4.5	0	5	17	9	1	0	0	0	0	0
November	29.89	30.03	29.71	32	79	85	73	12	89	67	22	73	7	7	5.9	16	4.8	0	5	17	7	1	0	0	0	0	0
December	29.92	30.09	29.71	38	77	84	71	13	88	64	24	72	7	7	5.1	18	3.7	0	10	17	3	1	0	0	0	0	0
Mean	29.95	0.02		79	85	72	13			70		67	7	8	52.6	176	5.1	10.5	0	81	205	63	10	5	1	0	0
Total																											0
Extreme values				30.12	29.41	71			90	61	29																0
Number of years' observations	40		23				6				23		6		23		22						6				23

<sup>1</sup> Height of anemometer unknown. Readings taken at 9 m.  
<sup>2</sup> During the 23 years, 1895-1917, one gale was recorded in September, 1899. <sup>3</sup> A hurricane passed over the island in September, 1898.

Hours of observation—9 a. m. and 3 p. m.  
 Authorities: Meteorological Reports, Barbados (Botanic Station). Meteorological Observations (Extract Blue Book), Barbados.

*Grenada (Richmond Hill). Latitude 12° 03' N., longitude 61° 45' W. Height above mean sea level, 508 feet (155.1 m.)*

[Meteorological table compiled from 9 to 29 years' observations, 1887, 1891-1918]

Month	Barometer <sup>1</sup> at 32° F., mean sea level, and latitude 45°				Air temperature						Relative humidity <sup>2</sup>		Rain			Wind <sup>1</sup>		Number of days gales		Number of days logs																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
	Mean		Extreme		Mean		Extreme		Range	Maximum	Minimum	Range	Total fall	Number of days	Maximum fall in 24 hours	Mean velocity, miles per hour <sup>2</sup>	Number of days from—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
	For month	Daily range	Maximum	Minimum	Range	Maximum	Minimum	Range									Day	Night	North	Northeast	East	Southeast	South	Southwest	West	Northwest	Calm																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
January	29.92	Inch.	30.09	Inch.	77	82	72	10	90	67	23	74	4	4.4	Inch.	3.5	7.5	5.9	2	13	8	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

<sup>1</sup> From observations taken at 9 a. m. and 6 p. m.

<sup>2</sup> From observations taken at 9 a. m.

<sup>3</sup> Height of anemometer above ground, 15½ feet (4.7 m.).

Authorities: Meteorological observations taken at Grenada (extract Government Gazette).

Trinidad. Latitude 10° 39' N., longitude 61° 30' W. Height above mean sea level 67 feet (20.4 m.)

[Meteorological table compiled from 8 to 57 years' observations, 1862-1918]

Month	Barometer at 32° F., mean sea level, and latitude 45°				Air temperature						Rain			Wind										Number of days gales	Number of days logs	
	Mean		Extreme		Mean			Extreme			Cloud amount, scale 0 to 101	Rain		Mean force, Beaufort scale	Number of days from—											
	For month <sup>1</sup>	Daily range	Maximum	Minimum	Range	Maximum	Minimum	Range	Total fall <sup>2</sup>	Number of days		Maximum fall in 24 hours <sup>3</sup>	North		Northeast	East	Southeast	South	Southwest	West	Northwest	Calm				
January.....	Ins.	Ins.	Ins.	Ins.	° F.	° F.	° F.	° F.	° F.	Ins.	12	Ins.	3	16	2	5	1	2	1	1	1	0				
February.....	29.92	30.06	29.83	29.86	76	85	67	18	96	57	39	80	2	13	3	5	1	1	2	0	0					
March.....	29.92	30.09	29.86	29.86	77	86	67	19	95	60	35	77	5	1	3	6	1	1	1	3	0					
April.....	29.92	30.09	29.86	29.86	77	87	67	20	99	60	39	77	6	1	3	7	1	1	1	3	0					
May.....	29.92	30.09	29.86	29.86	78	88	68	20	99	60	39	75	6	1	3	7	1	1	1	3	0					
June.....	29.92	30.09	29.86	29.86	80	89	70	19	98	57	41	75	6	1	3	7	1	1	1	3	0					
July.....	29.92	30.12	29.86	29.86	79	87	71	16	97	60	37	80	7	1	4	7	1	1	1	3	0					
August.....	29.92	30.09	29.86	29.86	79	87	71	17	97	52	45	81	7	3	11	4	6	1	2	1	3	0				
September.....	29.89	30.03	29.80	29.83	78	86	71	15	93	60	33	83	7	9	12	4	0	2	1	3	0					
October.....	29.86	30.06	29.80	29.80	79	88	71	17	98	61	37	82	6	7	14	5	0	2	1	3	0					
November.....	29.86	30.03	29.74	29.74	79	87	70	17	94	61	33	82	6	7	12	6	1	2	1	3	0					
December.....	29.89	30.06	29.74	29.74	78	86	70	16	97	60	37	82	6	4	14	4	1	2	1	3	0					
Mean.....	29.89	0.09			78	87	69	18																		
Total.....		30.12	29.74	32					101	52	4.9		64.2	173	28	153	40	71	10	21	12	29	1			
Extreme value.....																										
Number of years' observation.....	40		9		28		29		19	57	28															

<sup>1</sup> Hours of observation—7 a. m. and 3 p. m. <sup>2</sup> Maximum fall during the month. <sup>3</sup> Maximum fall during any 24 hours ending 9 a. m. during the month.

Authorities: Trinidad Blue Book.



APPENDIX V  
VIEWS



View 1.

*Harbor Point*

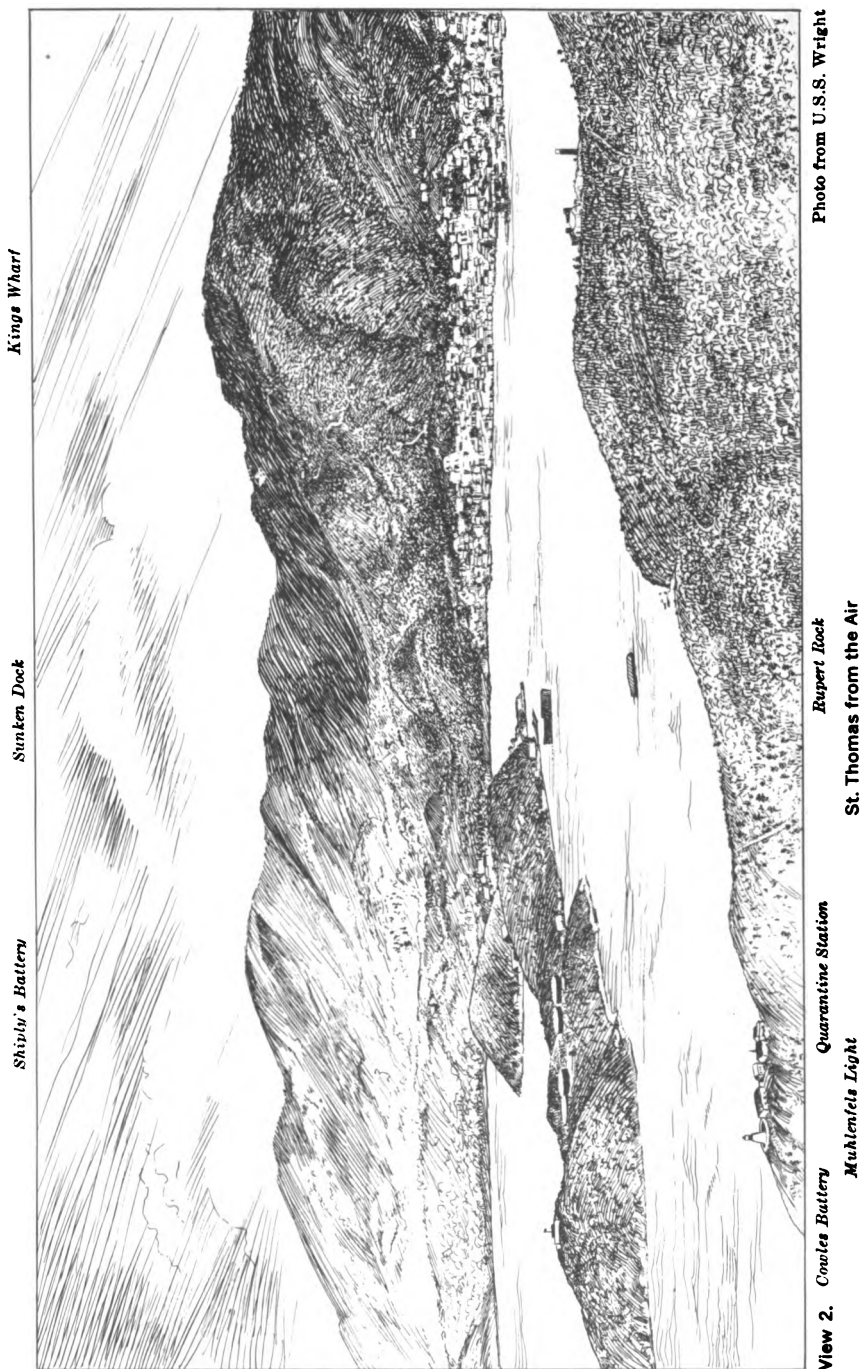
*Hurricane Hole from the Air*

*Turner Point*

*Photo from U.S.S. Wright*



# APPENDIX V

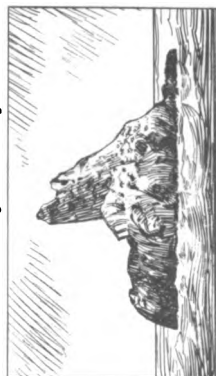






# APPENDIX V

*Buck Island Light  $24^{\circ}$  true 14 miles*



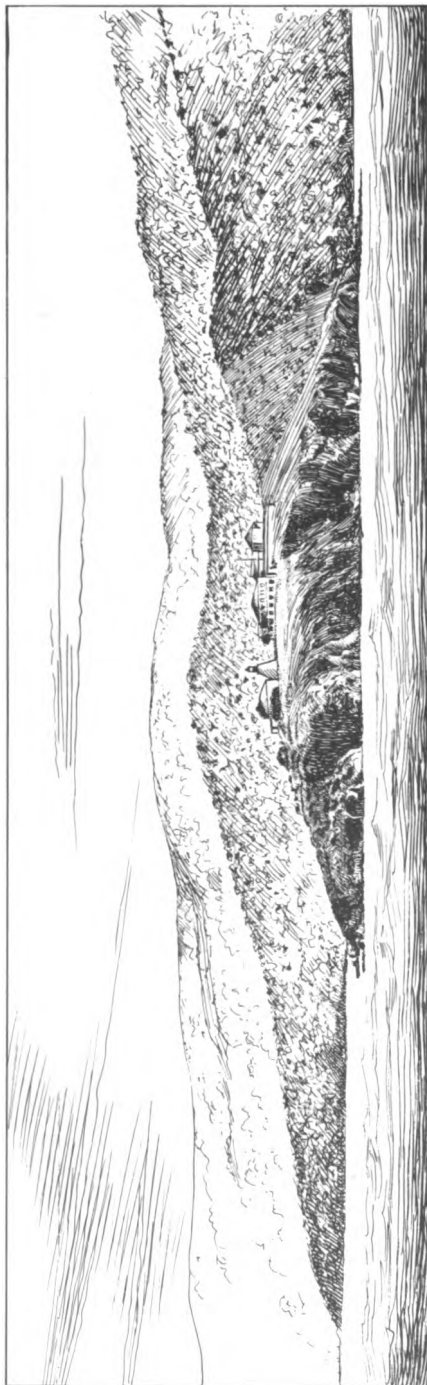
From Commandant Naval Station St. Thomas

*Capella Island*

**View 4.**



*Muhlenfels Pt. Light  $22^{\circ}$  true 1000 yards*

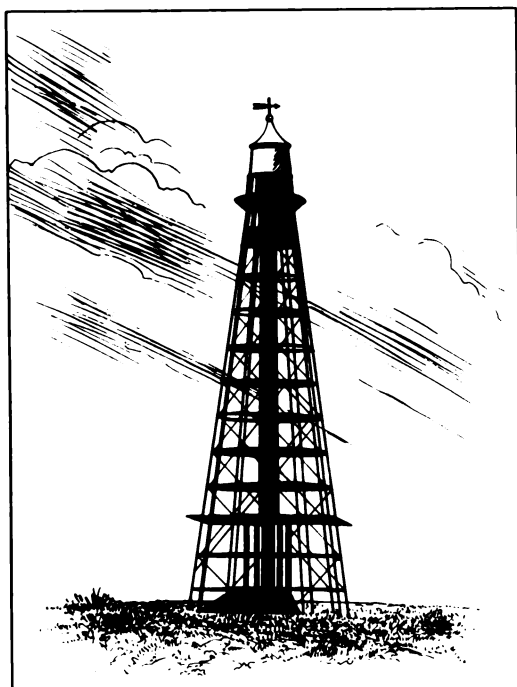


From Commandant Naval Station St. Thomas

**View 5.**



## APPENDIX V



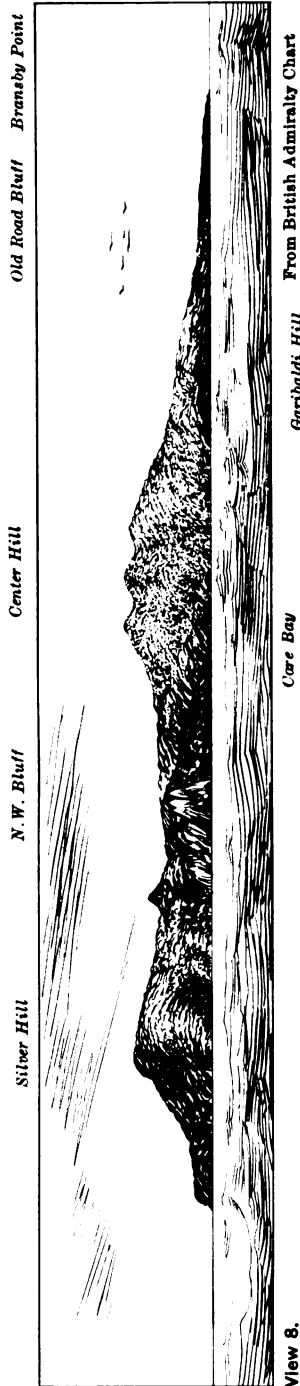
**View 6.** From British Admiralty Sailing Directions  
**Sombbrero Island Lighthouse**



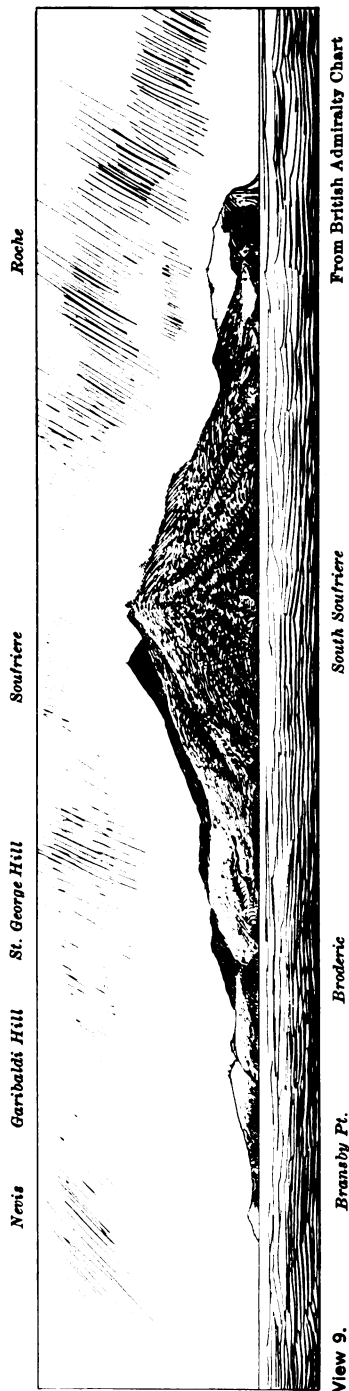
**View 7.** From British Admiralty Sailing Directions  
**Saba Island Peak  $11^{\circ}$  true, 12 miles**



# APPENDIX V



Montserrat from the Northward



Montserrat from the Southward



# APPENDIX V



**View 10.** Rodonda, bearing 157° distant 8 to 10 miles  
From Dutch Chart

*Treasury Light*  
*St. George Chapel*  
*Clay Hill*  
*Pier Landing*



**View 11.** Basse Terre, St. Christopher from Anchorage  
Pier Landing Photo by Mr. L. H. Irish





# APPENDIX V



View 12. Water Mill 64' Grove Estate Plymouth From British Admiralty Chart

Montserrat from Plymouth Anchorage 1050 yds. from shore



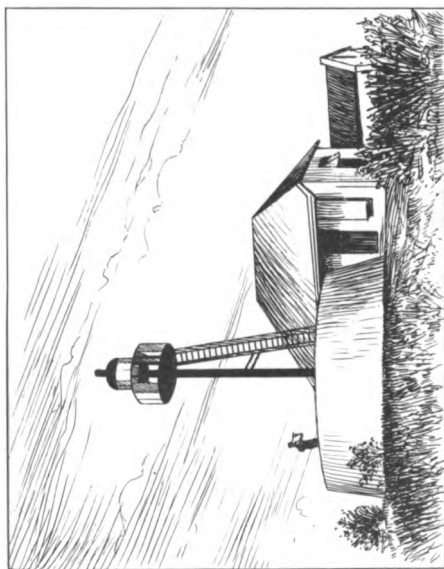
Willemstad



View 13 (in two parts) The Tafelberg Curacao, from 8 miles south off Santa Anna harbor entrance From British Admiralty Sailing Directions Canon Point



# APPENDIX V



**View 14.** From British Admiralty Sailing Directions  
Point Saline lighthouse, Grenada.



**From Dutch Chart**

**St. Eustatius from the Northeast**

**View 15.**



# APPENDIX V

Hooiberg Mt. in range with Catholic Church bearing 98°



View 16.

Quarantine Station  
Oranjestad from Seaward

Protestant Church

From Dutch Chart

Petit Cannouan 238° 9 miles

Savan Island 310° 6½ miles



View 17.

Savan Rock  
Northern Grenadines

From British Admiralty Chart

Dove Cay

Taftia Hill

The Peake 352° 7 miles

N.E. Pt.



View 18. S.W. Hill

Friendship Hill

Cannouan

Mr. Snag's Ho.

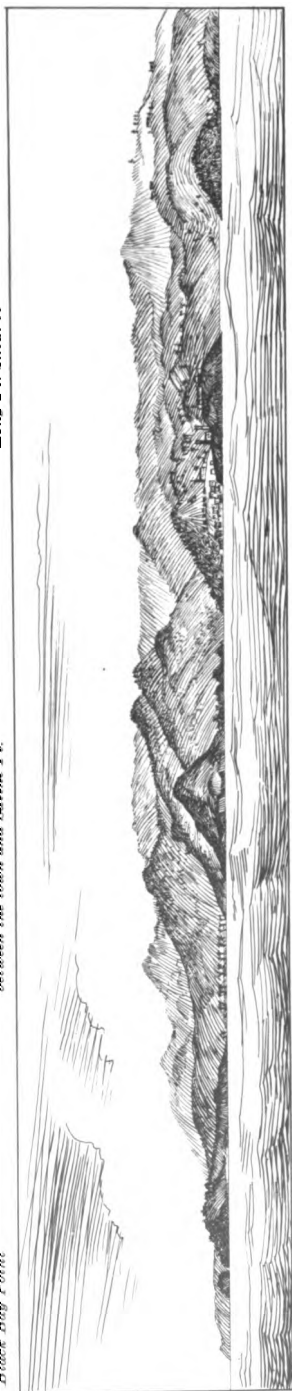
From British Admiralty Chart

Cannouan from the Southeast



# APPENDIX V

*Black Bay Point*  
*Rocky Pt. of St. Eloy in range with Mt. Moritz clears the shoals between the town and Saline Pt.*  
*Mt. Maitland*  
*Ft. George Pt. in line with Gort. Ho. clears Long Pt. Shoal 58°*  
*Pt. Frederic*



**View 19.** *Boismorice Pt.*

*Grand Mal Bay*

*Eloy Hill Mt. Melville*

*Town of St. George Ft. George*

**From British Admiralty Chart**

## St. George, Grenada and Vicinity

*Grenada*

*Right end of Lenera I. tangent to left of Grenada 101°*

*Lenera I.*



**View 20.**

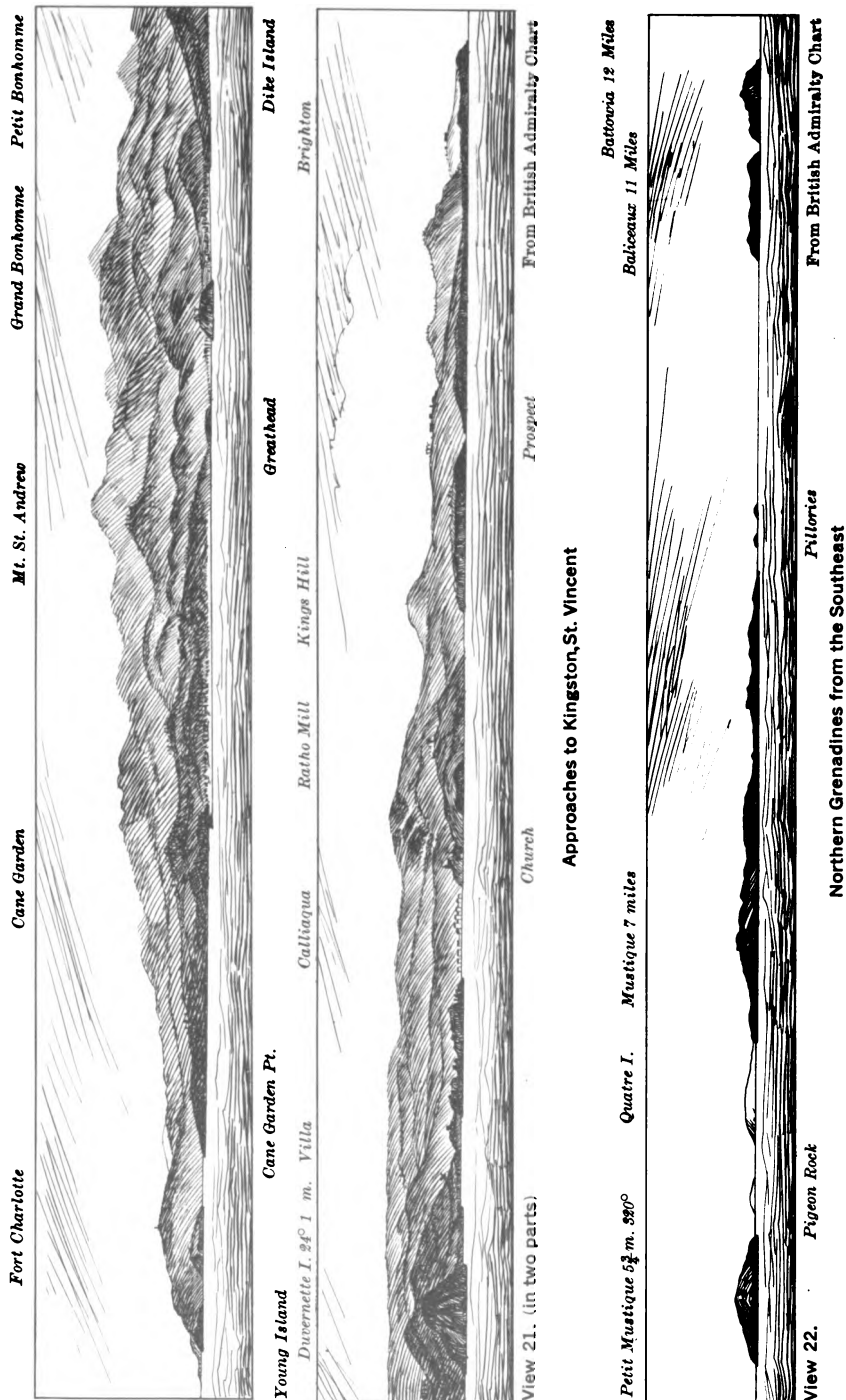
**Anchorage Mark for Irvin's Bay**

**From British Admiralty Chart**





# APPENDIX V





# APPENDIX V

*Boca de Nariño*

*Boca de Hueros*

*Boca Mono*



*Hucros I.*

*Mono I. 170° 7 miles*

*Trinidad I.*

*La Isletta 246°*

*Penas Pt.*

*Boca Grande*

*Chacachacare I.*



*From British Admiralty Chart*

*Goose I. (Pato) 221°*

*View 23. (in two parts)*

*Bocas de Dragons from the Northward*

*Banquilla I.*

*Orquilla I.*

*I. del Pico 185° about 10 miles*



*From British Admiralty Chart*

*Islands of Los Hermanos*

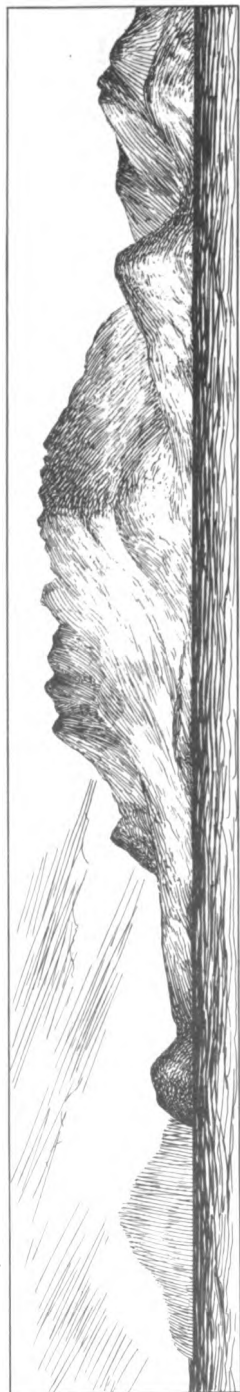
*View 24.*



# APPENDIX V

*St. Christopher*

*St. Eustatius*



*Brimstone Hill*

**View 25.**

**From Dutch Chart**

**St. Eustatius open Southward of Brimstone Hill bearing 324°**

*Pico de Naguata 211° 28' miles*

*Mt. de Avila 280°*



*La Silla de Caracas 219°*

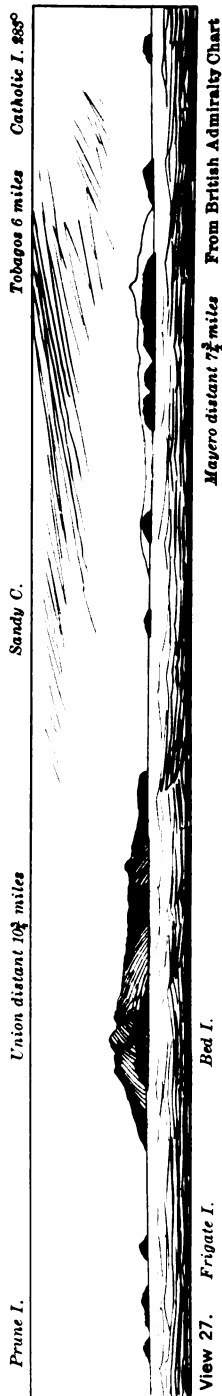
**From British Admiralty Chart**

**View 26.**

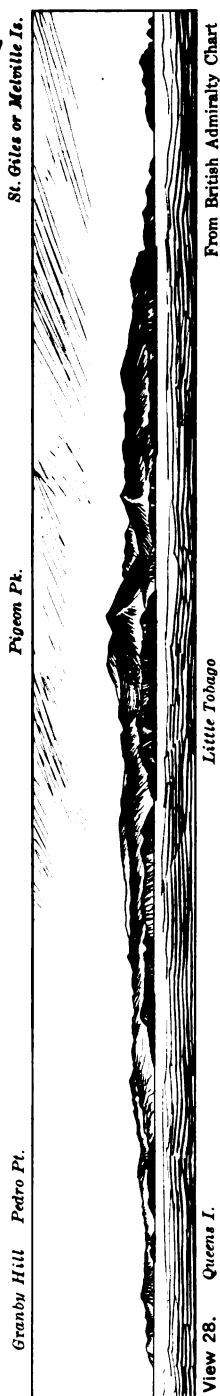
**Approach to La Gualra**



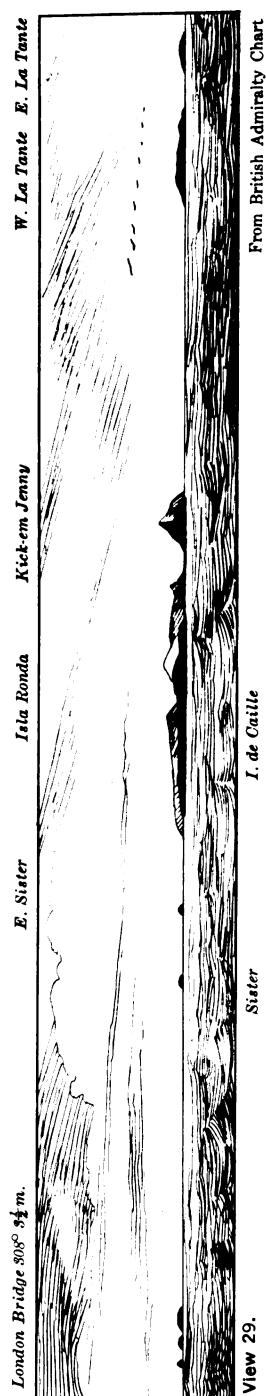
# APPENDIX V



Union and Mayero Island from the east



Tobago from the East 6 miles distant



Island to Northward of Grenada from the Southeast





# APPENDIX V

Oranjestad Hoornberg 75° 14 miles.



View 30.

From British Admiralty Sailing Directions

Aruba Island from the westward

Vigie Port Castries Mt. Abercrombie Morne Fortune



View 31.

From British Admiralty Chart

Port Castries, the Northwest corners of Market House and wharf in line with first shoulder of South Ridge 116°

Little Martinique 9 1/2 miles

Little St. Vincent 237° 9 miles



View 32.

From British Admiralty Chart

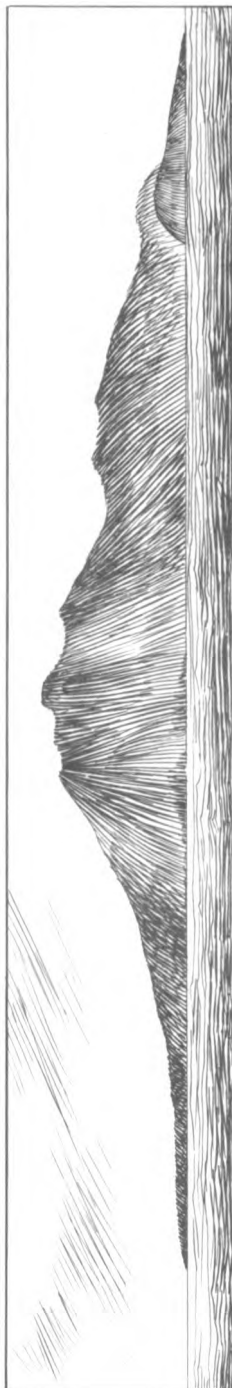
Carriacou 12 miles



# APPENDIX V

*Brintone Hill*  
*Otleya Level*

*Mount Misery*



View 33.

From British Admiralty Sailing Directions

Mount Misery, St. Christopher I., 115° true, 14 miles

*Green I. 280° 5 miles*  
*Leclera I.*

*Leclera Peak*

*St. Catherine's Mts.*    *St. Marks Mts.*



View 34.

*Sandy I.*    From British Admiralty Chart

*Marli Hill*

North end of Grenado



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